AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

AUGUST 1, 1956

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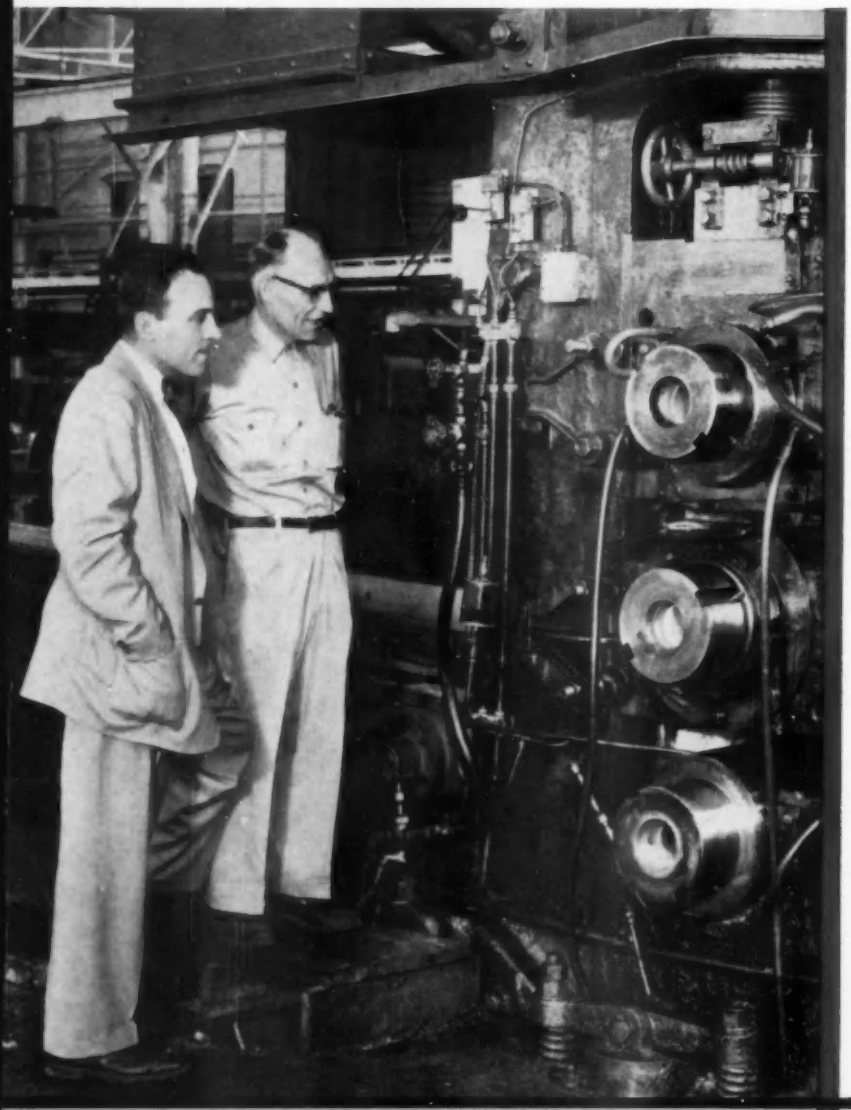
A CHILTON PUBLICATION

Sick slab roll recovers fast with application of STANOGEAR *Compound*



A slab roll at Matthiessen & Hegeler Zinc Company, La Salle, Illinois, was sick. It suffered from repeated roll neck bearing failures. Bearing temperatures couldn't be controlled. A consultant was summoned—Marshall J. Fox, Standard Oil lubrication specialist. His diagnosis and remedy: Install STANOGEAR Compound and equip the machine with a central pressure system for application. Recommendations were followed. Result: No bearing failures, due to faulty lubrication, since. Maintenance costs reduced. Time lost through breakdowns slashed.

This was a condition made to order for STANOGEAR to remedy. And Matthiessen & Hegeler knew there was a man at hand who could suggest what should be done. It's another demonstration of what this unbeatable combination can do when put to work:

1 **Standard Oil lubrication specialists capable of giving technical help.**

2 **Top quality products *that deliver results required.***

STANOGEAR Compounds contain special additives making them suitable for applications where heavy loads cause welding, seizure or scoring.

In the Midwest and Rocky Mountain states, a Standard Oil lubrication specialist in your nearby Standard Oil office will gladly give you more information about STANOGEAR. Call him. Or contact Standard Oil Company, 910 So. Michigan Avenue, Chicago 80, Ill.

Eugene Ewald (right), Mill Foreman, and Marshall Fox, Standard Oil lubrication specialist, inspect slab roll. STANOGEAR Compound helped solve lubrication problem on roll neck bearings.

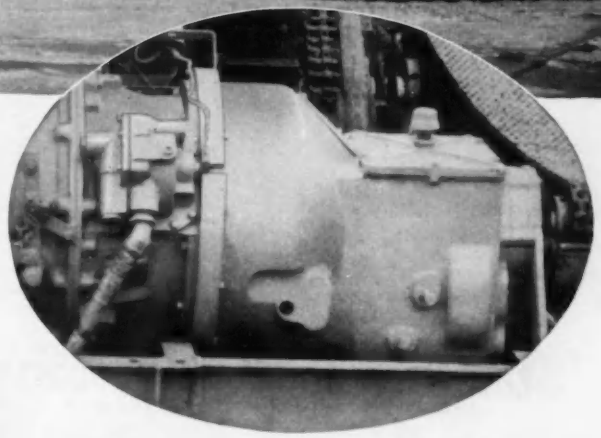
Marshall Fox who proposed switch to STANOGEAR with resultant improved operation, is experienced in providing such technical service. Marsh has a Mechanical Engineering degree from Purdue to qualify him for this work. In addition, he has completed Standard's course for sales engineers. This experience and training, customers find, pay off for *them*.

STANDARD

STANDARD OIL COMPANY

(Indiana)

Smoother lifts, heavier loads — with Cotta heavy-duty transmission



Lifting loads one and one-half times heavier, with smoothness and precision, is characteristic of this crane which has been repowered with a diesel engine driving through a Cotta heavy-duty forward-reverse transmission built for use behind a torque converter. Operator has fingertip control with an air cylinder which actuates the disconnect clutch of the torque converter. Transmission operates mostly in forward gear; reverse is needed only when lowering the boom, or load, under power.

Cotta has solved thousands of power transmission problems like this with units that are low in first cost, rugged and dependable, as well as economical to maintain. If you need a standard or special power transmission unit in the input torque range of 150 to 2000 ft lb, *your best source is Cotta.*

If you build rail cars, cranes, winches, drill rigs, trucks, or other heavy-duty mobile equipment, and are considering application of torque converter drives, Cotta will build an "engineered-to-order" transmission to your specifications. It will be a rugged, dependable unit to do the job, under severe operating conditions, for the life of your equipment.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA
HEAVY-DUTY
TRANSMISSIONS
"Engineered-to-order"

Weight-saving frameless type van built of chromium-nickel stainless steel retains impressive beauty of silvery white metal despite wear and tear of travel. Deadweight reduction holds down operating and maintenance costs for Piedmont Mountain Freight Lines, of Charlotte and North Wilkesboro, North Carolina. Van produced by Black Diamond Trailer Co., Inc., Bristol, Va.

Stainless steel adds capacity, yet cuts weight

THE BODY of this 32-foot trailer is fabricated from Type 301 chromium-nickel stainless steel.

High mechanical properties of Type 301 helped the designer dispense with the frame, and reduce deadweight, yet increase over-all strength of the van.

As a result, the unit carries additional payload without a corresponding increase in axle loading. But this isn't the only advantage afforded by stainless steel.

The good forming and welding qualities of Type 301 permit swift, simplified fabrication, and make it easy to strengthen the sides with an integral-column ribbed construction offering exceptional resistance to side-bulging.

Particularly important to body-builders, stainless steels containing nickel provide not only high strength, but also ample toughness to withstand impact and battering, wear and abrasion. Resistant to corrosive attacks of rain, sleet, ice and atmosphere, these steels retain their silvery white beauty and remain easy to clean and keep clean.

Where you want long, money-saving performance, put stainless steel on the job. Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. We'll be glad to help you select exactly the right type of stainless for your specific needs. Send us details of your application for our suggestions.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N.Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

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NEW ROTOR AIR GRINDERS

...FOR CONE WHEELS AND 4" STRAIGHT WHEELS

NEW DESIGN . . . . . more powerful
. . . . . long service life

8500 RPM . . . . . fast grinding

ONLY 8 1/2 LBS. . . . . . less fatigue
. . . . . more output

SPECIFICATIONS

WEIGHT . . . . . 8 lbs., 8 oz.
LENGTH . . . . . 20½"
(19" for spade handle model)
SPEEDS . . . . . 8500 RPM
6000 RPM
EQUIPMENT (Standard)
⅜" x 11 Spindle, Wheel Guard
EQUIPMENT (Optional)
½" x 13 Spindle, Cone Wheel Adaptor

The big difference is in the new motor. Some grinder!

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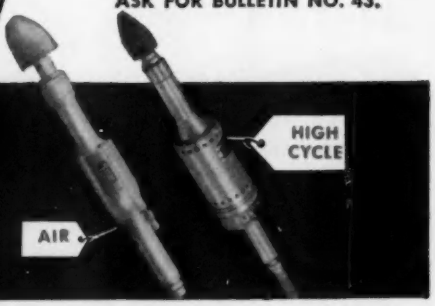
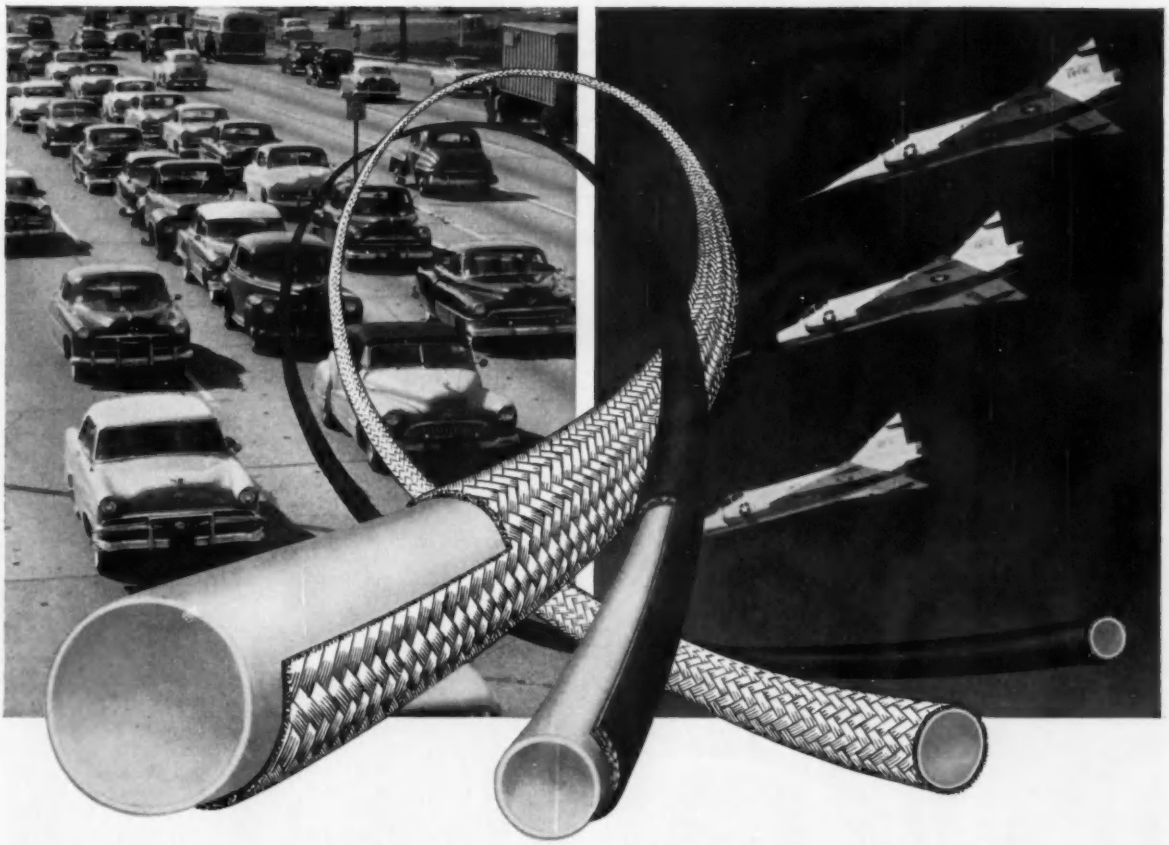


THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



BEAT CORROSION AND FATIGUE

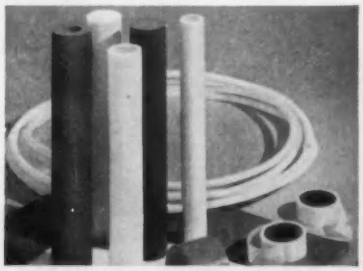
with the hose that can take it

Wherever hose must really stand the gaff, your best bet is R/M Flexible Thin-Wall "Teflon"* Hose.

This new hose—stainless steel wire-braided or rubber covered—features extreme flexibility and does not expand, contract or fatigue. It also has great resistance to high temperatures and corrosive lubricants. The braided jacket type meets MIL-5511 specifications in all designated sizes.

This contribution to better performance and greater safety on the road and in the air is a result of R/M's long experience with "Teflon." Ever since it first came into use, our laboratories have been developing the vast potentialities of this material for all phases of industry. Write for complete information.

*Du Pont trademark



Other R/M "Teflon" products for the automotive and aviation industries include rods, sheets, tubes and tape; centerless ground rods held to very close tolerances; stress-relieved molded rods and tubes; Raylon—a mechanical grade of "Teflon" with many of the characteristics and properties of virgin "Teflon." For details, call or write R/M.

RM

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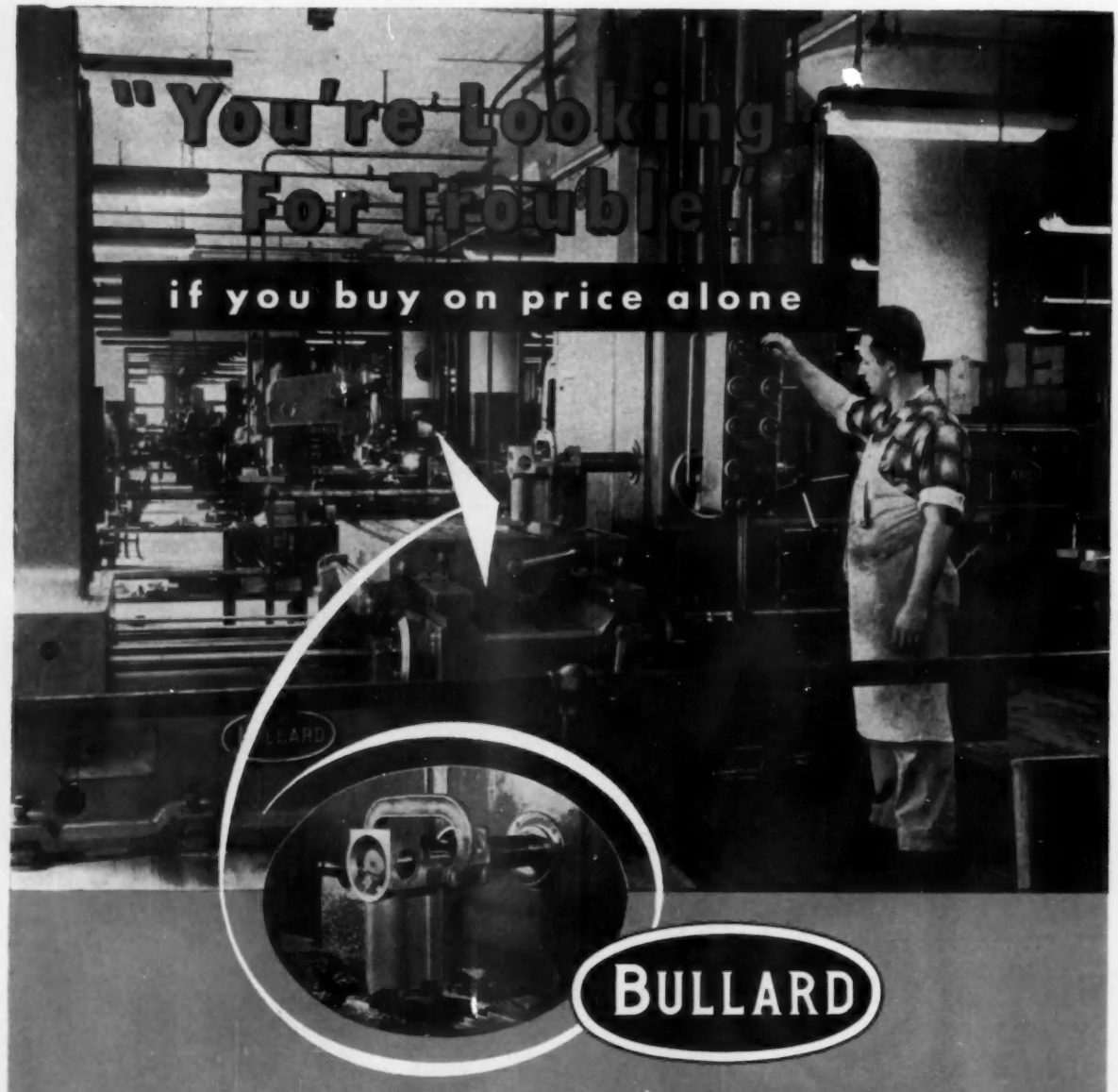
PLASTIC PRODUCTS DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC.: Engineered Plastic, Industrial Rubber and Sintered Metal Products • Packings • Asbestos Textiles • Abrasive and Diamond Wheels Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Laundry Pads and Covers • Bowling Balls

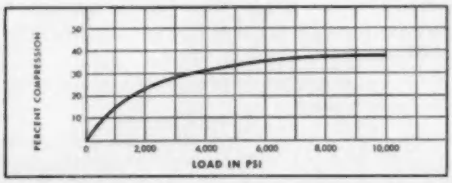


"Like many other firms," says Mr. A. Balas, Equipment Engineer at Mergenthaler Linotype Co., N.Y.C., "we are constantly on the alert for new equipment, new processes and new ideas. This constant search for improvement convinced us of the need to purchase a versatile, time-saving, cost-saving and, above all, accurate Horizontal Boring Machine. We checked them all — feature for feature — and then bought the Bullard H.B.M., Model 75. We feel it has enough "built in reserves" to take care of any contingency or new development which may come up. It's reassuring to know that an investment of this size won't go out of style next month."

Why don't you get the full story on the many features and advantages offered you with a Bullard H.B.M., Model 75 in your plant. For a complete line catalog, just call your nearest Bullard Sales Office, Distributor or write

THE BULLARD COMPANY BRIDGEPORT 9, CONN.

Accopac fiber gasket won't dry out or shrink



COMPRESSIBILITY. N-820, less compressible than other Accopac materials, is recommended for heavy-duty applications where minimum flange pressures will be 2,000 psi and where temperatures will not exceed 250° F.

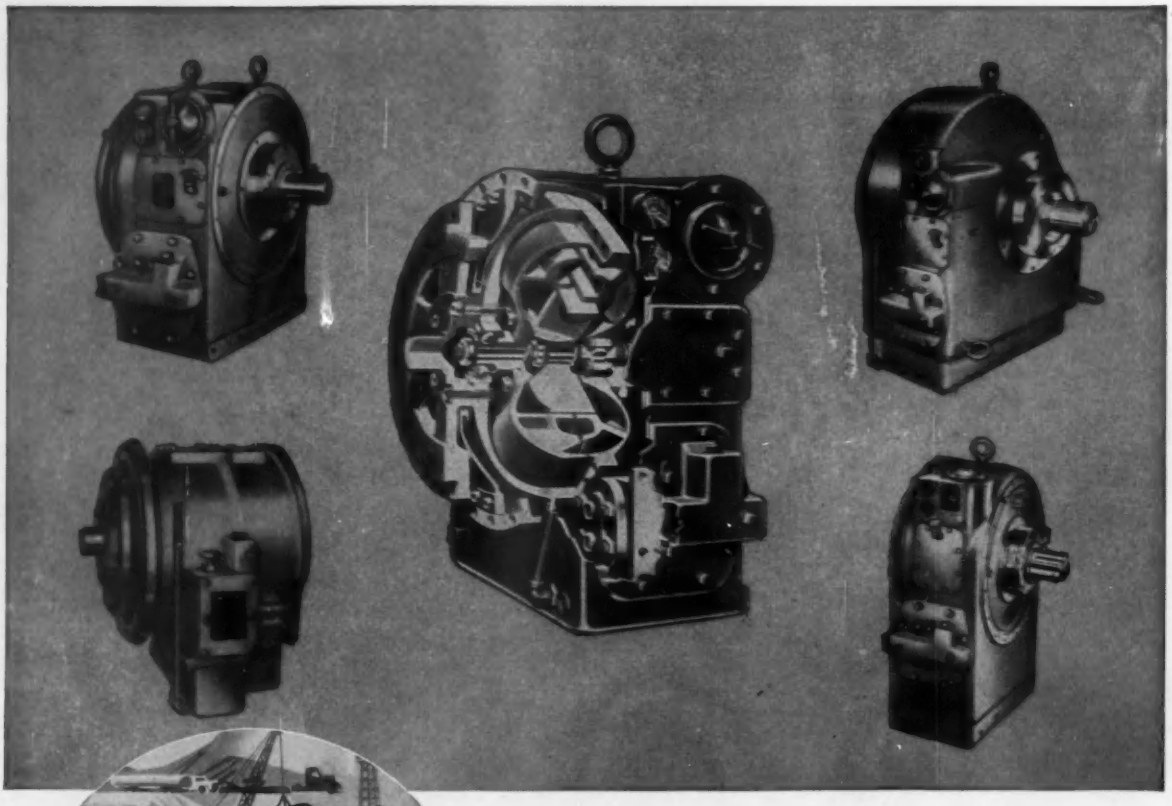
Combinations of heat and pressure that cause ordinary plant fiber gaskets to fail are handled successfully by Armstrong Accopac® N-820—a dense new material made by a patented Armstrong process. It requires a minimum flange load of 2,000 psi and seals at temperatures up to 250° F.

The special latex binder in N-820 will not leach out in alternately wet-and-dry applications. Shrinkage due to binder loss is eliminated because N-820's binder is non-volatile and non-extractable. It stays in.

N-820 is already being used successfully on a wide range of heavy-duty applications, often as an economical replacement for asbestos sheet packing where temperatures do not exceed 250° F. For more information and a copy of "Armstrong Gasket Materials," write to Armstrong Cork Co., Industrial Division, 7008 Imperial Ave., Lancaster, Penna.

Armstrong ACCOPAC

. . . used wherever performance counts



For your power need, *whatever it is,* there's a "right" TORCON Model

With a horsepower range from 15 to 600, and fly-wheel diameters from 11 to 26 inches, Torcon has a model that's right for your need — a standard unit available immediately for original equipment or for field installation.

Your real benefits begin after Torcon is installed—

- **more work and less wear: Torcon blade design balances engine efficiency and horsepower through the working range—smooth, shockless power that reduces wear, prolongs life**
- **integral unit includes oil pump, sump, pressure regulator; much better efficiency with minimum maintenance**

Are you constantly on the look-out for ways to get more efficient power at less cost? Talk to Clark—on all problems of power transmission, from flywheel to point of torque application. You'll find, as do many leading equipment manufacturers, that it's "good business to do business with Clark".

CLARK EQUIPMENT COMPANY, Transmission Division

Falahee Road • Jackson 2, Michigan

Other Products of the Clark Automotive Division . . . TRANSMISSIONS • AXLE HOUSINGS • TRACTOR UNITS • TORCON TORQUE CONVERTERS • ELECTRIC STEEL CASTINGS • GEARS and FORGINGS • FRONT and REAR AXLES for TRUCKS, BUSES and OFF-HIGHWAY EQUIPMENT.

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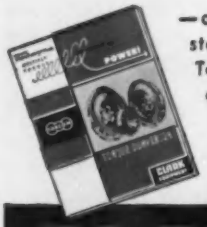


—a concise, helpful statement on how Torcon installations cut operating costs, prolong equipment life.

CLARK® EQUIPMENT

Standard Air Filter ▶

DU PONT
Reg. U.S. Pat. Off.
Better Things for Better Living ... through Chemistry

AUTOMOTIVE ENGINEERING NEWS

PROPERTY AND APPLICATION DATA ON THESE VERSATILE ENGINEERING MATERIALS: "ZYTEL," "ALATHON," "TEFLON," "LUCITE."

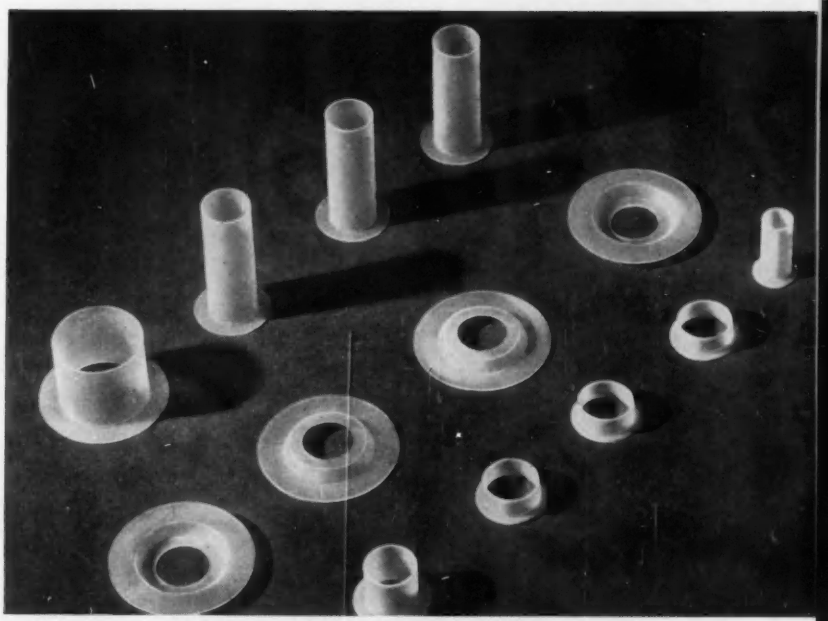
Bearings of ZYTEL® nylon resin resist wear ... can operate with or without lubrication

Simple sleeve bearings of "Zytel", with lubrication, can support loads up to 1,000 lbs. psi at rubbing velocities up to 500 feet/min.

The physical properties of Du Pont "Zytel" nylon resin are particularly applicable to the field of automotive engineering. The strength, heat resistance, resilience and lightness in weight of "Zytel", coupled with its moldability, have already been put to use in many specific jobs.

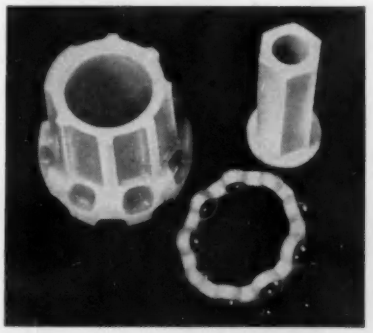
"Zytel" as a bearing material is unique in that it can perform satisfactorily over a useful range of loads and operating conditions, with little or no lubrication. This characteristic is extremely valuable for bearings which must operate in hard-to-reach spots where lubrication is a problem. The resistance of "Zytel" to oils, gasoline and grease further expands its range of usefulness.

Of equal interest are the design possibilities that exist with *lubricated* bearings of "Zytel". Recent Du Pont laboratory tests revealed that simple sleeve bearings of "Zytel", under conditions of hydrodynamic lubrication, can support loads up to 1,000 psi at rubbing velocities up to 500 fpm with negligible wear. These tests also revealed that with "Zytel", hydrodynamic lubrication can be maintained with a minimum amount of lubricant present. In one case, with only an initial lubrication of a bearing, the bearing operated continuously for 41 days without increase in temperature or torque.



These brake-pedal bushings and window crank-handle bearing plates are made of "Zytel". The parts give smooth, quiet operation and provide long-wearing bearing surfaces which, after assembly, do not have to be lubricated for the life of the vehicle.

It may pay you to examine your own automotive-design requirements with "Zytel" in mind. If you have a bearing-design problem, consider these many advantages of "Zytel". It may help you cut costs, simplify production and increase operating efficiency. For the most recent specific information and test data, fill out and mail the coupon below.



Representative bearings and bushings of lightweight "Zytel" nylon resin feature excellent abrasion resistance, toughness in thin sections, heat resistance and resiliency.

NEED MORE INFORMATION?

For complete details that will help you further evaluate Du Pont "Zytel" for use in your product development program, mail the coupon at the right.

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department, Room 178, Du Pont Building, Wilmington 98, Delaware

Please send me more information on Du Pont "Zytel" nylon resin. I am interested in evaluating this material for_____

NAME_____ TITLE_____
COMPANY_____
STREET ADDRESS_____
CITY_____ STATE_____
TYPE OF BUSINESS_____

Standard Air Filter ▶

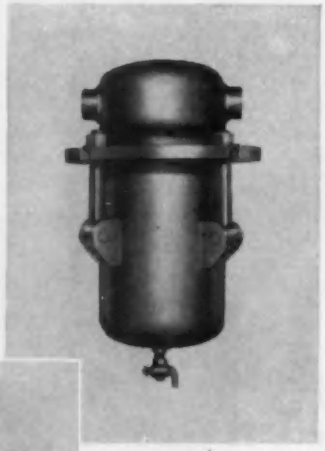
▲ Manual Loading Regulator

NOW—available through your

HSM
HONEYWELL SUPPLIES MAN

Performance-engineered filters and regulators for pneumatic instrumentation

Heavy Duty Air Filter ▼



Your pneumatic control instruments need clean, dry air at the right pressure to assure best performance. That's where Brown air filters, dripwells and regulators fit into your plant's control systems. Available through your local Honeywell Supplies Man, these essential accessories protect instruments . . . reduce maintenance . . . keep control performance at peak level. A complete line, in a range of sizes and capacities, gives ample choice to match your specific needs.

Ask your Honeywell Supplies Man about these air control accessories. And ask him, too, to tell you how the HSM Plan can apply personalized attention to all your instrument supplies purchases . . . with attractive dollar savings, reduction in inventory, and simplified paper work. Call him today at your local Honeywell office . . . as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

▲ Combination Air Filter and Pressure Regulator

● **REFERENCE DATA: Write for Catalog 8951, "Pneumatic Control Accessories" . . . and for the booklet, "The HSM Plan."**

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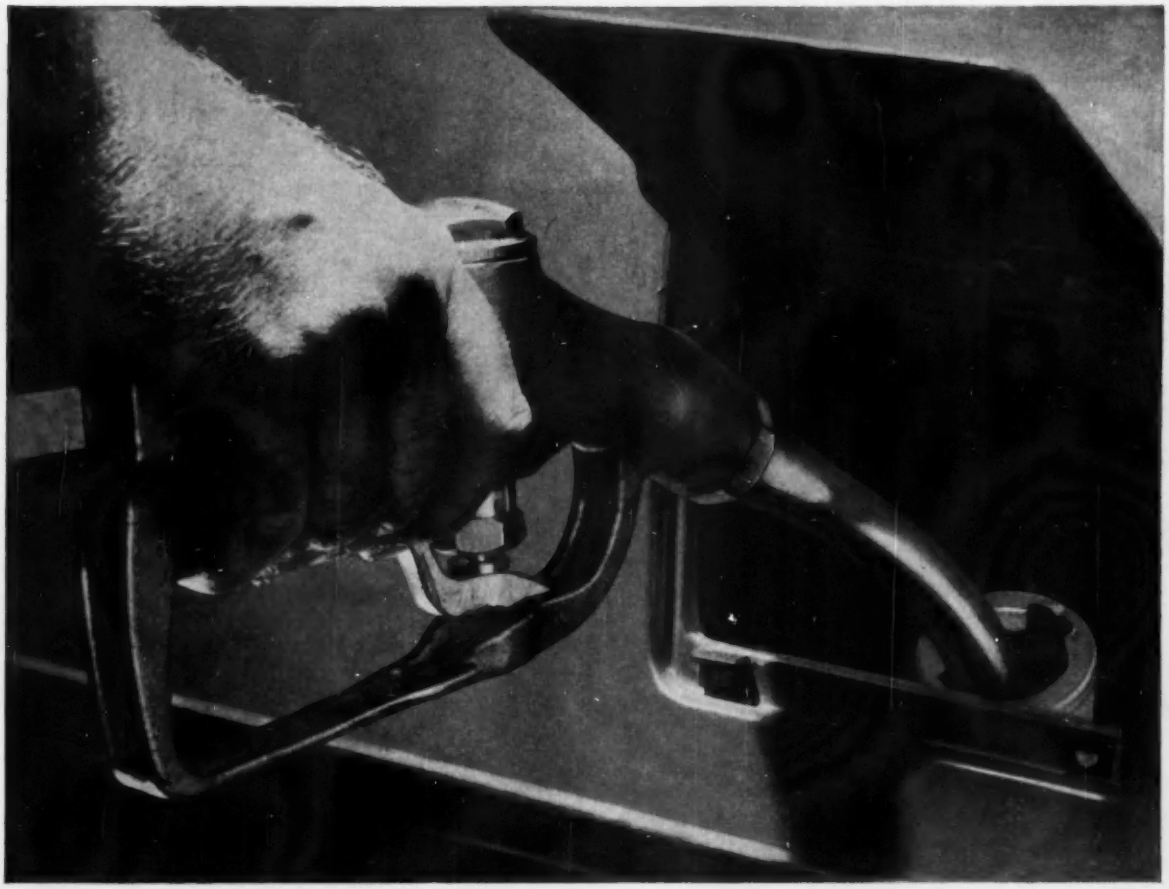
Honeywell
BROWN INSTRUMENTS
First in Controls



Can STROMBERG—champion economy carburetor—help sell cars?

The question is directed to manufacturers whose cars are not yet equipped with Stromberg Carburetors. Car makers using Stromberg now are also using its outstanding economy record in the Mobilgas Economy Run to convince thousands of economy-minded customers.

A large segment of your market—people in every income bracket—is always motivated by economy of operation as well as style, power and other good features. Proof that the motor car industry is well aware of this fact is its participation in the Mobilgas Economy Run every year, knowing how much a victory helps new-car sales.

Stromberg-equipped cars have won the coveted Sweepstakes Award in this national economy tournament two straight years!

If economy is a touchy subject instead of a good, solid selling feature with your line of cars, it will pay you to make comparative efficiency tests with Stromberg Carburetors against the field.

Remember, for more than forty years more advances in carburetion have been initiated by Stromberg than any other manufacturer. Stromberg application engineers are at your service.

ECLIPSE MACHINE DIVISION OF BENDIX AVIATION CORPORATION

Original Equipment Sales: Elmira, N.Y. • Service Sales: South Bend, Ind.
Export Sales and Service: Bendix International Division, 205 E. 42nd Street, N.Y. 17, N.Y.

Stromberg® Carburetor Bendix® Electric Fuel Pump Bendix® Folo-Thru Starter Drive

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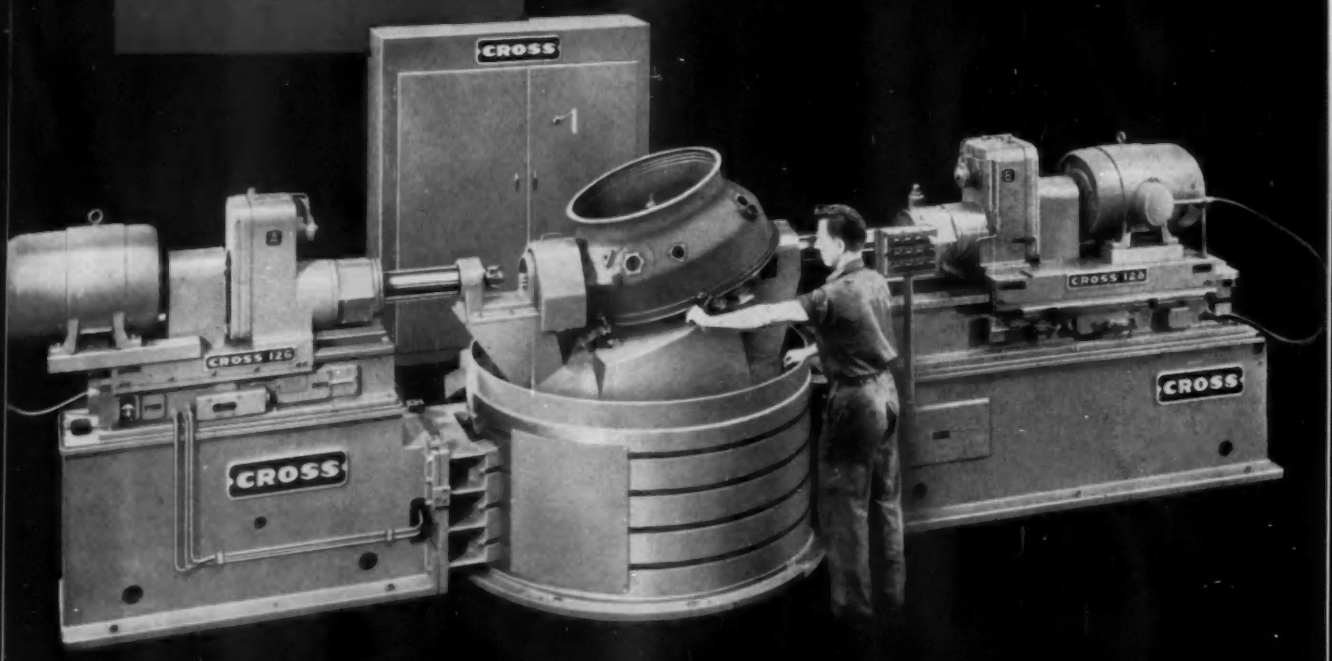
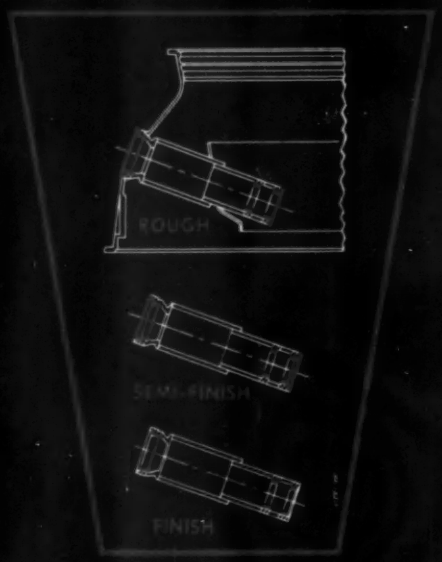
ECLIPSE MACHINE DIVISION ELMIRA NEW YORK

Bendix AVIATION CORPORATION

Precision Bores and Faces Diffuser Cases

Another Special by Cross





This Two-Way Boring Machine roughs, semi-finishes and finishes the accessory drive shaft hole of Jet Engine Diffuser Cases at the rate of 2½ pieces per hour. The operator places the part in the work holding fixture and the rough boring cutters in the boring spindles, after which the rough boring is performed automatically. Next, the operator replaces the rough boring cutters with semi-finish boring cutters and the cycle is repeated for the semi-finish boring operation. Then, the finish boring operation is performed in a similar manner and the part is removed.

The cutters are supported in live precision bearing spindles, which are in turn supported by hardened and ground steel bushings adjacent to the work.

All cutters are pre-set for size and are quickly and easily changed for the different operations.

To provide maximum flexibility for future part design changes, the machine is built with Cross Modular "Building Block" Units.

Established 1898

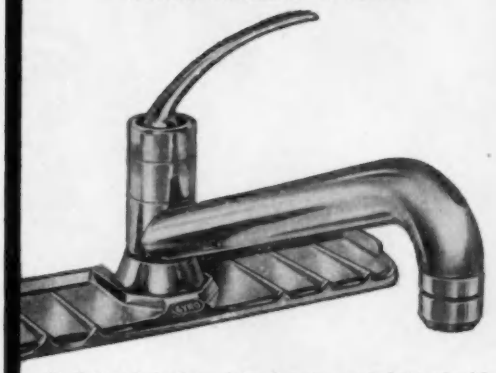
THE CROSS CO.

First in Automation

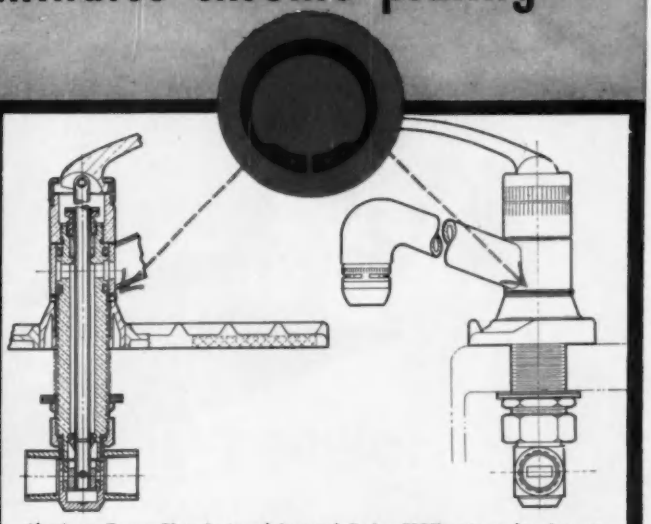
DETROIT 7, MICHIGAN

Waldes Truarc ring reduces valve body from 1 5/16" to 1 1/16", eliminates chrome plating

GYRO MIXING FAUCET



Single-handle kitchen mixing faucet controls hot and cold water, as well as volume. Radical design has no seals or spindles to replace. One Waldes Truarc retaining ring allows complete assembly and disassembly from either top or bottom of unit.



Aluminum Truarc Ring (external inverted Series 5108) acts as bearing retainer, insures precise alignment of spout and escutcheon, gives uniform shoulder with machining. Truarc ring provides shoulder that would otherwise require machining valve body to 1 5/16" against 1 1/16" used. Also eliminates expensive chrome plating of valve body.

Gyro Brass Manufacturing Corporation of Westbury, L. I., N. Y., uses a single Waldes Truarc retaining ring (Series 5108) both as a positioner and retainer on their Gyro Mixing Faucet. Aluminum Truarc ring not only eliminates expensive machining, but also does away with a chrome plating process that would be necessary if the shoulder were made of the solid material of the body.

You, too, can save money with Truarc Rings. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Waldes Truarc Rings are precision-engineered...quick and easy to assemble and disassemble.

More than 5,000 stock sizes of the different Truarc ring types available. Ninety stocking points throughout U. S. A. and Canada.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES TRUARC® RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

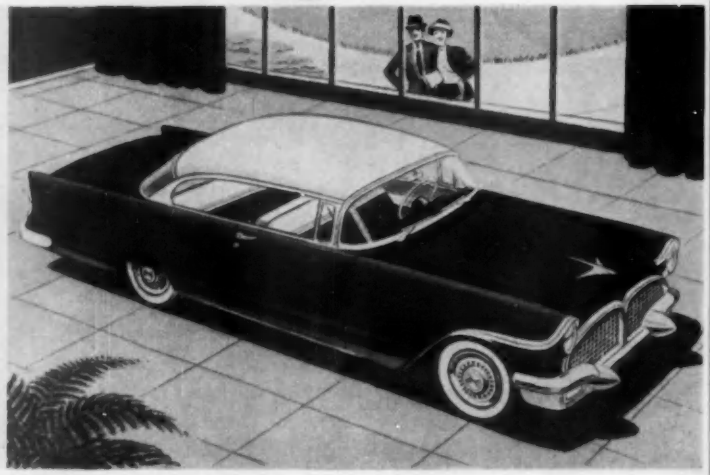
Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

Name.....
Title.....
Company.....
Business Address.....
City.....*Zone*.....*State*.....

2AY006

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787. and other U. S. Patents pending. Equal patent protection established in foreign countries.

But **low**
and behold
today's high style!



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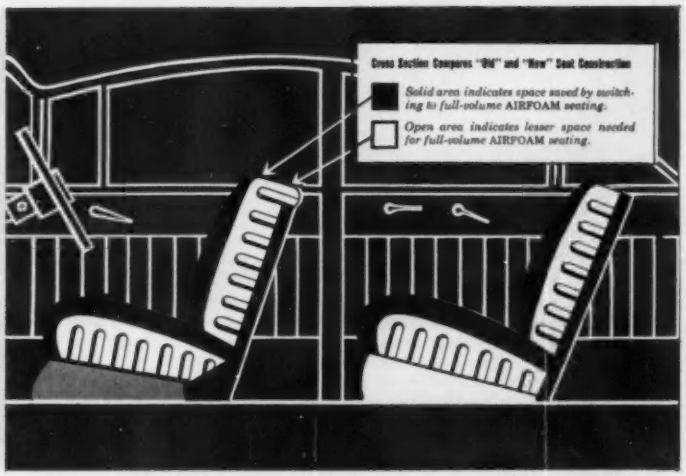
there was room for bulky seating AND people!

Now see how **AIRFOAM** saves space, style and sales with new **R-O-O-M** FOR COMFORT!


Cross Section Compares "Old" and "New" Seat Construction
Solid area indicates space saved by switching to full-volume AIRFOAM seating.
Open area indicates lesser space needed for full-volume AIRFOAM seating.

Exciting new seating ideas become *practical* with AIRFOAM

AIRFOAM can be your greatest sales-aid in years

YOUR DEALERS CAN MAKE MORE SALES, more easily, when they can offer styling in the latest trend – PLUS a new roominess that smacks of sheer magic.

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THESE NEW AIRFOAM SEAT-UNITS employ brand-new principles of space-engineering, impossible for old style cushioning. That's why AIRFOAM Seat-Units find priceless R-O-O-M where none existed before – *and without sacrifice of comfort!*

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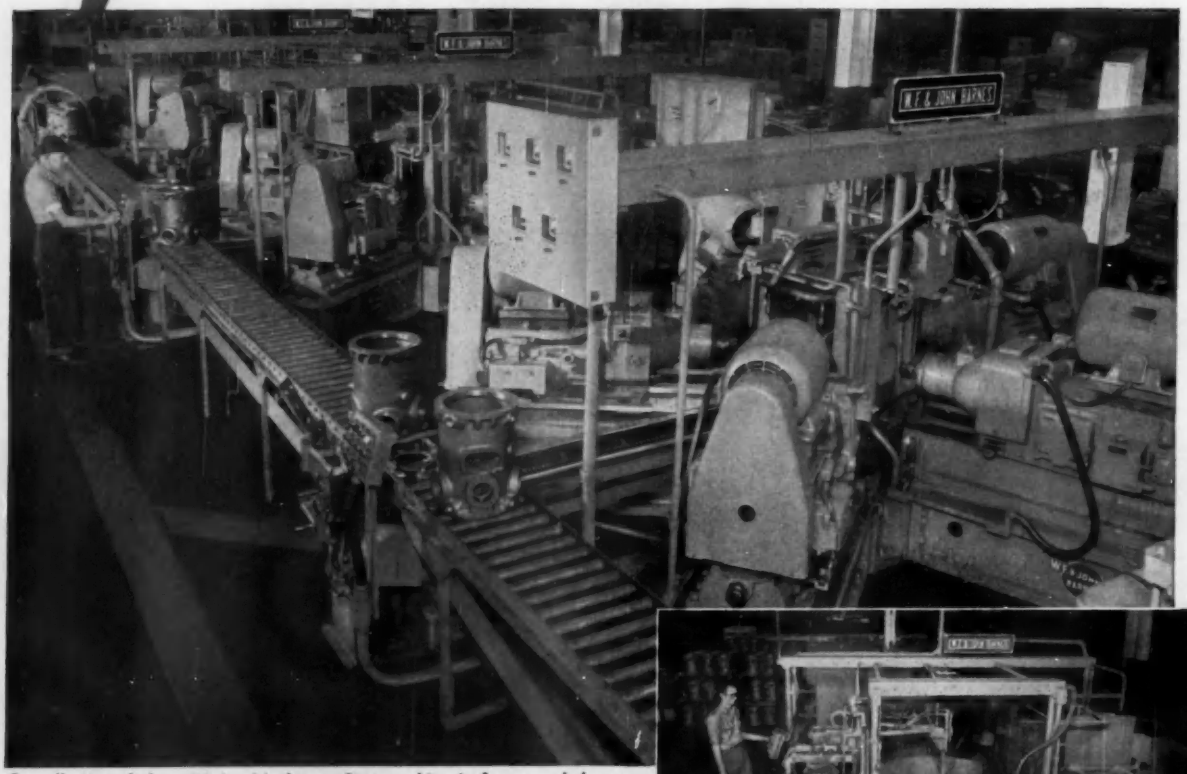
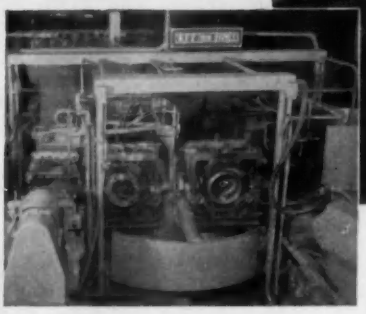
YEAR

HOW W. F. & JOHN BARNES

"Specials" Cut Costs on



Overall view of three 5-Way Machines. First machine in foreground, bores and faces 5 flange holes; second, performs 8 combination drilling and chamfering operations; third, handles 14 tapping operations. All three machines are equipped with power transfer from gravity conveyor. One operator loads and unloads three machines at pushbutton stations.



View showing workpieces in center turntable after 180° turn, ready for traversing into new machining position. Machining cycle at station 2 allows operator time for unloading and loading at station 1 without losing production time.

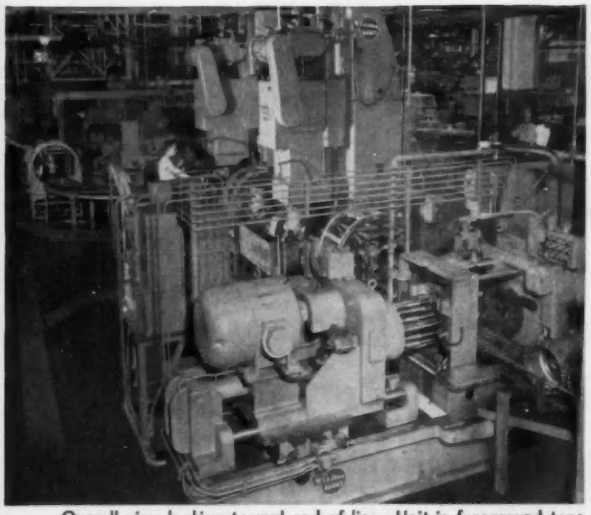
4-Way Machine with reciprocating index fixture. Left-hand two-spindle heads drill and finish-ream .750" dowel holes in both ends. Right-hand single stub-spindle heads bore, chamfer and face stator and cylinder ends.

W. F. & JOHN BARNES

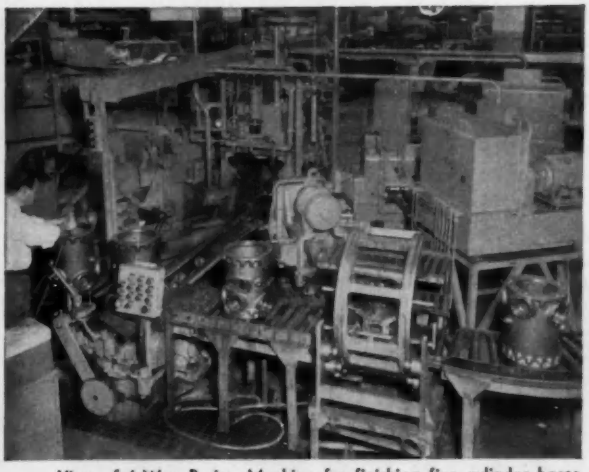
BUILDERS OF BETTER MACHINES SINCE 1872

MULTIPLE SPINDLE DRILLING · BORING · TAPPING

Low Production Work



Overall view looking toward end of line. Unit in foreground taps 31 holes in ends of piece and presses in two center bushings. Vertical machines are facing units for machining stator end and hub, and cylinder end and hub.



View of 6-Way Boring Machine for finishing five cylinder bores and two babbited bushings. Concentricity of stator and crankshaft bores is held to max. of .005" T.I.R. Babbit chips are collected in separate chip box. C.I. chips for entire line are flushed automatically to a central system.

MULTI-STATION UNITS REDUCE MACHINING TIME ON COMPRESSOR CRANKCASES 1.85 HRS. PER PIECE

At Airtemp Division, Chrysler Corporation, Dayton, Ohio, a battery of ten Barnes Multiple Spindle Machines are today demonstrating the efficiency and economy of special machines engineered to serve relatively low production requirements. Previously, the compressor crankcases used in Airtemp's fine line of large 5-cylinder commercial air conditioning units were drilled, milled, bored, faced, and tapped in single operation machines. Now, most of these operations are performed automatically in Barnes specials. As a result, machining and handling time has been reduced 1.85 Hrs. per case. In addition, close tolerances are more easily maintained which has increased product quality.

PRODUCTION GEARED TO 15 CRANKCASES PER HOUR

The Barnes Multiple-Spindle Specials are incorporated into a semi-automatic production line which is geared to produce 15 crankcases per hour. Parts are moved between machines on gravity conveyors, and operators manually position workpieces into the loading station of each machine. Powered turnover and transfer devices are included to minimize manual effort. After more than 12 months of operation, the new line has effected savings equalling the preliminary estimates of Airtemp Engineers, and at the same time has provided the additional capacity to meet an increased demand for their product with little increase in floor space.

INVESTIGATE BARNES SIX-POINT COORDINATED MACHINE BUILDING SERVICE

We suggest you investigate the profit possibility of applying Barnes special machines to your work. Find out, too, how Barnes six-point coordinated engineering and building services can help you eliminate divided responsibility and save time. Write for free brochure or ask for an analysis on any specific job.

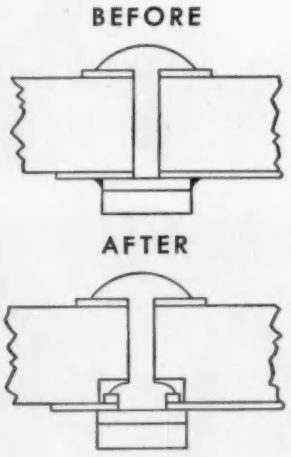
W. F. & JOHN BARNES COMPANY

403 SOUTH WATER STREET · ROCKFORD, ILLINOIS

MACHINES · AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

MALLORY

A change in design recommended by Mallory engineers for a magneto breaker assembly eliminated loosening of contacts in service . . . ended troublesome soldering operation.



Solving Contact Assembly Problems —by Mallory Contact Engineering

The way your electrical contact assemblies are put together is no less important than the materials you use. Mallory contact engineers can give you valuable help in assembly design and manufacturing techniques . . . to gain better performance, simpler production, and lower costs.

Here's an example . . . a breaker contact assembly for an outboard motor magneto. In the original design, the tungsten rivet contact was staked to the phenolic breaker arm. Cold flow of the phenolic material during operation would cause loosening of the rivet, and loss of electrical connection with a steel spring member that was attached between the contact and the breaker arm. To remedy this condition, the contact was soldered to the spring.

Mallory engineers saw an easier way to do the job better. They recommended a new method of assembly, using a stepped shank rivet contact, which could be staked first to the steel spring and then staked to the breaker arm . . . as shown in the illustration. The result—two simple staking operations replaced staking and soldering. And the customer got an assembly that gave better service . . . at economical cost.

Chances are that it will pay you to have Mallory take a look at your own contact designs. By putting our long experience in contact alloys, contact engineering and contact assembly to work, we can come up with interesting savings for you. Write or call us today.

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design . . .** in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

Serving Industry with These Products:

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Electrochemical—Capacitors • Rectifiers • Mercury Batteries
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MALLORY

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VISION IN PRECISION ENGINEERING

Creative engineering has long been identified with McQuay-Norris. From this pioneering spirit have come some notable achievements: *phosalloy* . . . *Chrome-Control* . . . the *400 oil ring.* If our progressive design and production facilities can serve you, we cordially invite your inquiry.

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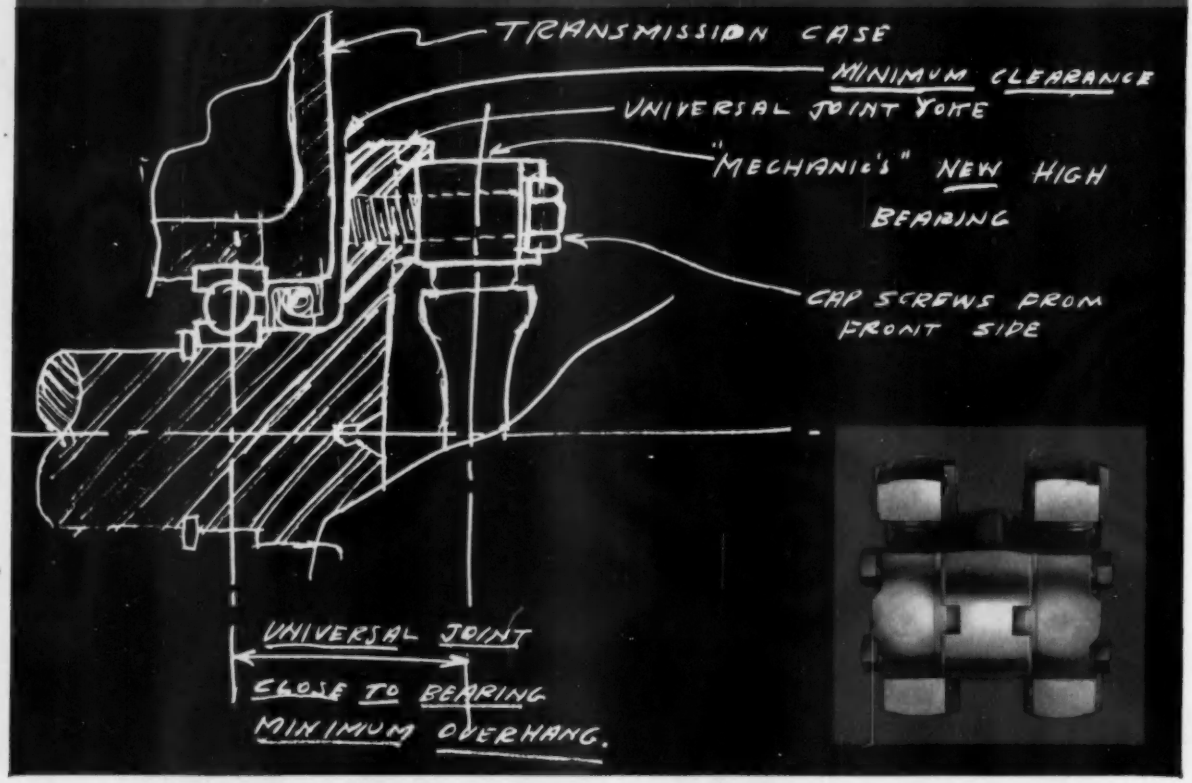
PISTON RINGS . . . HARDENED AND GROUND PARTS

McQUAY-NORRIS MANUFACTURING COMPANY
ST. LOUIS—TORONTO

SOLVE YOUR CLEARANCE PROBLEM THIS WAY



If you are faced with the problem of locating a universal joint in a space where limited clearance does not permit the use of a flanged joint, MECHANICS close-coupled Roller Bearing UNIVERSAL JOINT is your solution. This joint is specially designed for operation within cramped quarters that engineers formerly considered too short to accommodate a universal joint. Let our engineers show you how MECHANICS close-coupled UNIVERSAL JOINTS will conserve space, compensate for offset shafts and provide ample angularity in your new, compact models.

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UNIVERSAL JOINTS

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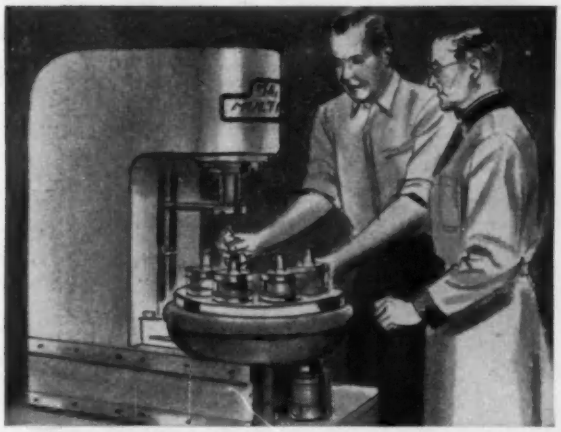
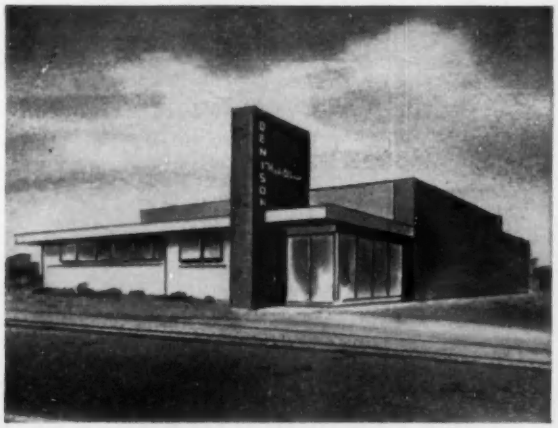
Complete hydraulic service... from one dependable source...

DENISON

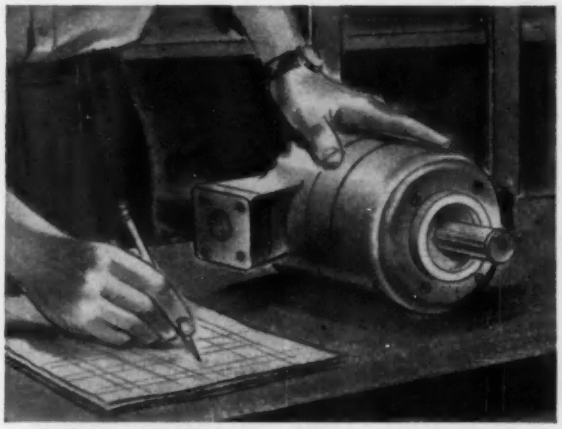
FREE APPLICATION ENGINEERING by experienced hydraulics specialists to improve your circuits.



JOB DEMONSTRATIONS to *prove* how your operations can be made more efficient with the new hydraulic developments.



REGIONAL FACTORY SERVICE includes *complete maintenance facilities* for building, testing, repairing equipment.



OVER-THE-COUNTER SALES from local stock to give you *immediate delivery* of hydraulic pumps, motors and controls.

Behind the name Denison... With its regional warehouses and branch offices, Denison's factory service is now as near as your telephone. Specialists in hydraulics are immediately available to help you build a better product, build it for lower cost.

Regional Warehouses in Chicago, Houston, Los Angeles, Clark, New Jersey. Branches in every principal city.

THE DENISON ENGINEERING COMPANY
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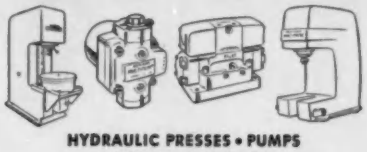
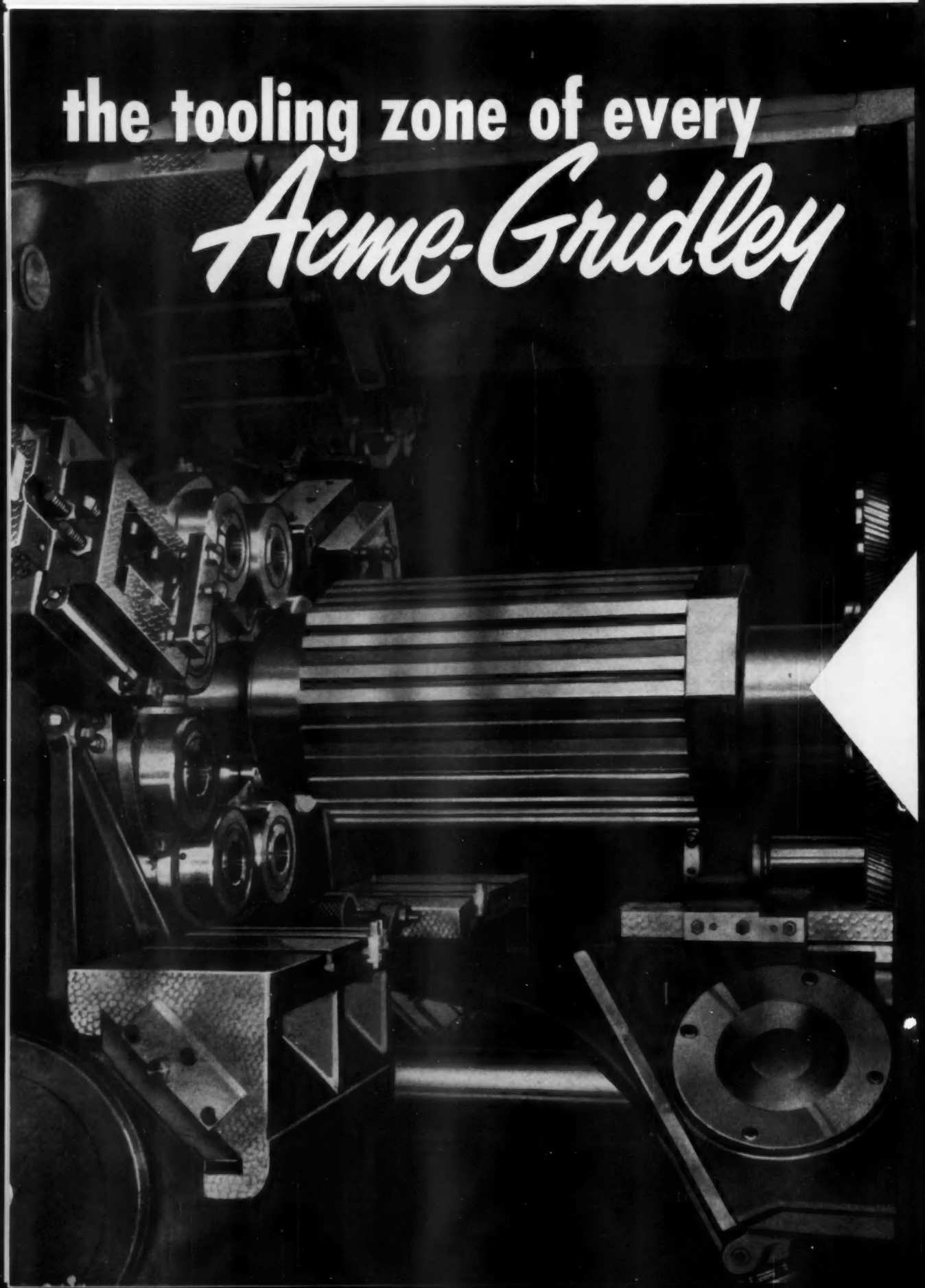
A Subsidiary of American Brake Shoe Co.

DENISON *HydrOILics*



HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS


the tooling zone of every
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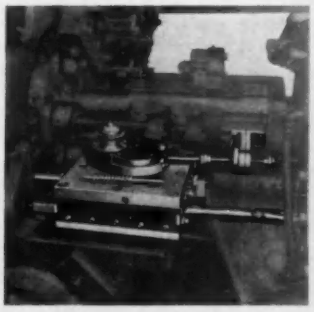
—open . . . for business!

Since the primary advantage of a multiple-spindle automatic is to make it possible to complete more operations in a single setup, accessibility *to* and plenty of space *in* the tooling zone, *to apply the maximum number of tools*, is especially significant.

When you want to speed up production, perform unusual operations, or to get a finer finish, let a National Acme tooling engineer apply his COMPLETE LINE experience in helping you select the attachments to perform these operations on your machine.

Combination Cross Milling and Drilling Attachment



Worm or Thread Generating Device

Threading or Tapping Tool

LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN

This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

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Photo sequence shows impact cleat burying itself in the tread of a nylon cord tire. Nylon cord tires can take this punishment up to 300,000 times, while ordinary tires will stand only about one-fifth as many blows.

THERE'S EXTRA SAFETY IN NYLON CORD TIRES

Tires are among the components that can help make today's fine cars even safer. For our roads—whether superhighway or city street—are traveled to a point that tire failure of *any* kind is a potential danger.

- Nylon cord tires offer utmost safety, surest protection against tire trouble. Nylon tires have proved their superiority on military and commercial planes and on heavy-duty trucks. The people whose lives and livelihood depend on the ability of cars to perform at high speeds rely on nylon tires. Turnpike police, professional auto racers and high-speed test drivers are examples.

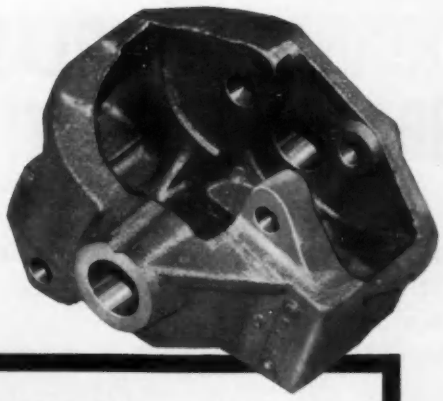
- Nylon cord tires reduce unsprung weight, and they readily absorb the added strains of power steering, braking, and higher horsepower.

- Nylon cord tires are among the components which contribute importantly to motor-car safety. They are the coming standard of the industry. As original equipment, they provide a valuable sales feature—extra safety.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

Du Pont produces the nylon fiber.
Tire manufacturers make nylon cord tires
—in tubeless or conventional types.

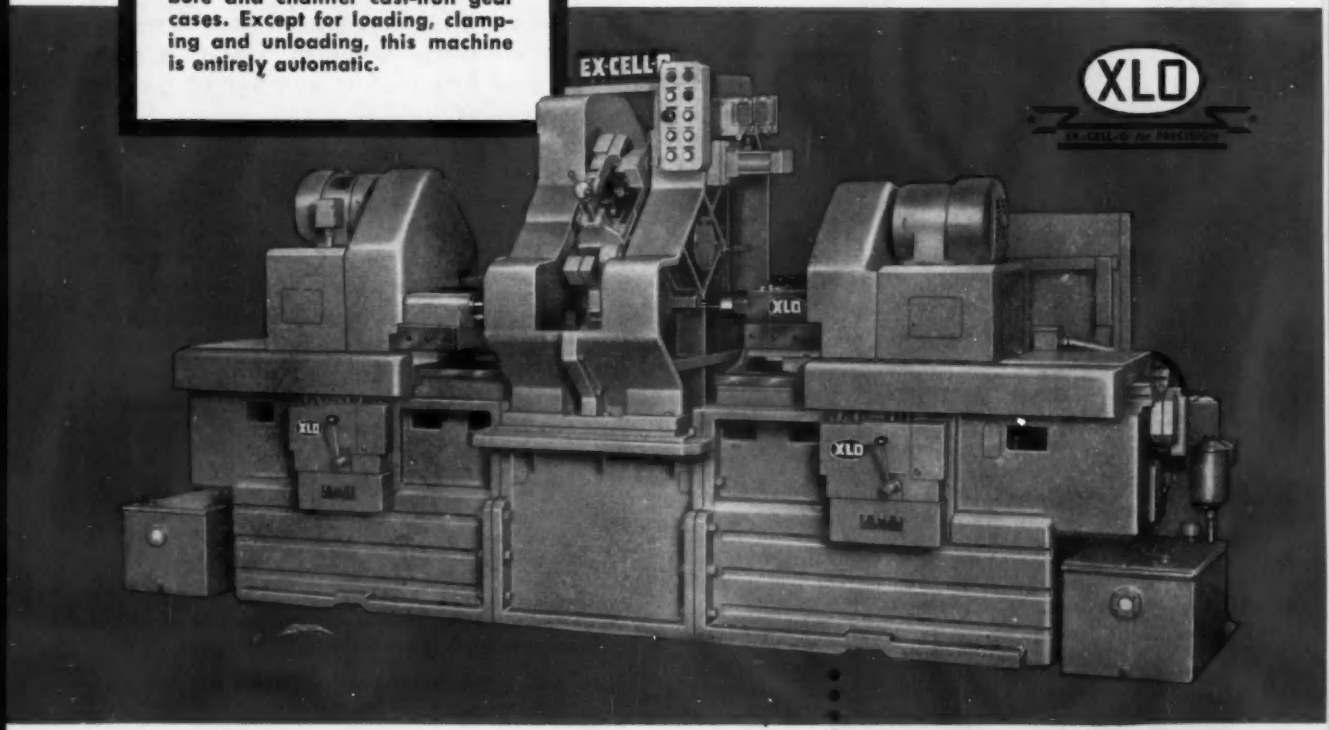


New Ex-Cell-O 2-Way Machine

speeds gear case production, lowers cost . . .

ABOVE: Gear case after machining. Hole sizes are held within .0005", centers .001".

BELOW: New Style 54-A Precision Two-Way Machine equipped to bore and chamfer cast-iron gear cases. Except for loading, clamping and unloading, this machine is entirely automatic.



Typical of Ex-Cell-O's constant improvement in the field of precision production is this new Style 54-A Two-Way Precision Boring Machine.

Operations on the cast-iron gear case illustrated include finish boring seven holes and chamfering diameters at two points. With its new hydraulic control panel each way unit has a greater range of feeds and a higher rate of rapid traverse.

Like all standard Ex-Cell-O Machines, the new 54-A is easily adapted at slight cost to a variety of precision setups. For further information, contact the Ex-Cell-O representative in your area, or write, wire or phone direct to Ex-Cell-O, Detroit.

EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-25

A Report on Automatic Arc Welding

A G-E WELDING ENGINEER EXPLAINS ARE TURNING MORE AND MORE TO

Roger W. Tuthill, Welding Process Engineer for the General Electric Company's Welding Department, answers some of the more frequently asked questions about the gas-shielded, consumable-electrode welding process.

Mr. Tuthill's answers explain the increased attention this process is receiving from production and welding people as automation begins to make greater demands on production welding.

Mr. Tuthill has been active in research and development on Fillerarc welding, General Electric's gas-shielded process, and has had a number of papers published on the subject.

Q. What is the gas-shielded welding process?

A. Gas-shielded welding is a consumable-electrode arc welding process which uses a reel of bare electrode wire fed mechanically through a welding head. Gas, such as carbon dioxide or argon, flows around the electrode to form a protective shield about the arc.

Q. Is there anything particularly new about gas-shielded arc welding?

A. Yes—if you're talking about *automatic* gas-shielded arc welding!

Historically, powdered flux has been used as the shielding agent in automatic arc welding, mainly because no gas process was economically feasible for welding mild steel. However, gas-shielding was attractive to many prospective users because it eliminated the many problems created by the use of flux—expensive flux recovery systems, flux inclusions in welds, flux in the air, more precise fixture requirements, and other difficulties.

Gas-shielding has been used for welding non-ferrous and stainless steels, but the relatively high costs of the inert gases used made gas-shielding impractical for mild steels.

Recently, the successful application of low-cost carbon dioxide as a shielding gas has finally made it economical to use gas-shielded equipment for welding mild steels. For example gas savings of 90% over inert gas costs have been reported. Since by far the most welding being done today is on mild steel, it is easy to see why this development is causing so many production people to turn to automatic gas-shielded arc-welding for answers to their production welding problems.

Q. Does a gas-shielded automatic welding system cost any more than other automatic arc welding systems?

A. The cost of setting up a gas-shielded system is about the same as for a comparable submerged-arc automatic system.

For example, while the *purchase* price of gas-shielded automatic equipment may be more than that of a submerged-arc system, the fact that there is no need for installing expensive flux recovery equipment and other cleaning systems with gas-shielded welding easily makes up the purchase price difference.

Q. Does the quality of welding done with gas-shielding compare with other welding processes?

A. Quality of welds made with the gas-shielded automatic welding process compares very favorably with other processes. Since no flux is used there is no possibility of flux inclusions; penetration is usually deeper; and the visible arc permits full control during welding. This visible arc permits less expensive fixtures to be used, an important cost factor in automatic welding.

Q. How about the speed and flexibility of a gas-shielded system? Can it be easily integrated into a production line?

A. A gas-shielded system can be used in production line welding as easily as any automatic welding system.

For example, the G-E Fillerarc system has electrode wire feed speeds which range up to 1000 inches per minute.

WHY FABRICATORS OF MILD STEEL AUTOMATIC GAS-SHIELDED WELDING

The automatic head can be rotated through 360 degrees and can be used for circular or seam welds, and, if necessary, more than one welding head can be used to make multiple welds.

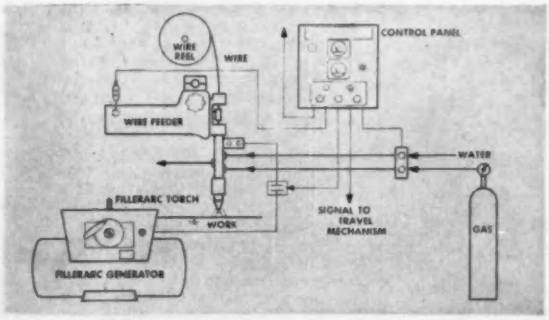
These characteristics make the Fillerarc system flexible and fast enough for almost any production line. Perhaps of equal importance to production people is the system's insensitivity to incoming line voltage, which assures constant production speed and weld quality.

Q. To sum up, what are the really important advantages of the automatic gas-shielded welding process?

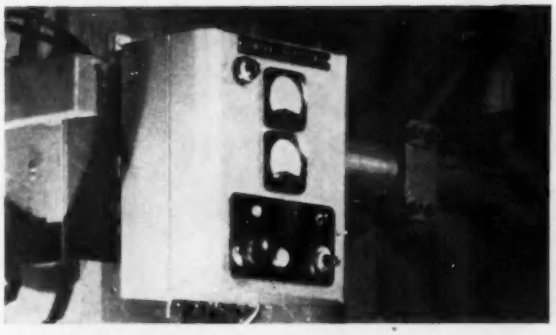
A. In a few words, the most important advantages of the automatic gas-shielded process are flexibility, high welding speeds, uniform weld quality, elimination of the cleaning problems associated with the use of flux, versatility for use with all types of metals, and most important of all, the ability to use low-cost carbon dioxide for shielding.

For more information about Fillerarc automatic gas-shielded welding see your nearby G-E Welding Distributor, or write for Bulletin GEC-1334, Section 713-4, General Electric Company, Schenectady, N. Y.

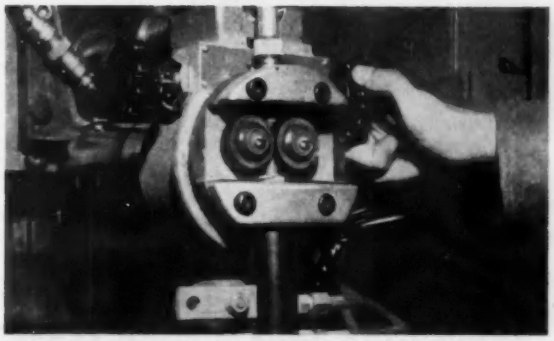
Now, General Electric offers four power sources for automatic gas-shielded welding—three new 800-amp rectifier welders and the already-proved 450-amp Fillerarc motor-generator set. They offer a complete choice of output characteristics and automatic features to suit your welding needs.



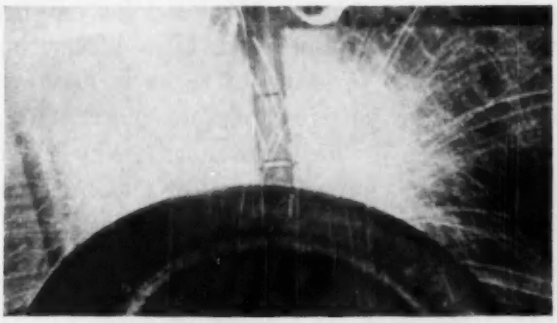
G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode, gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.



WIDE RANGE OF WIRE-FEED SPEEDS—up to 1000 inches per minute—makes the G-E Fillerarc system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



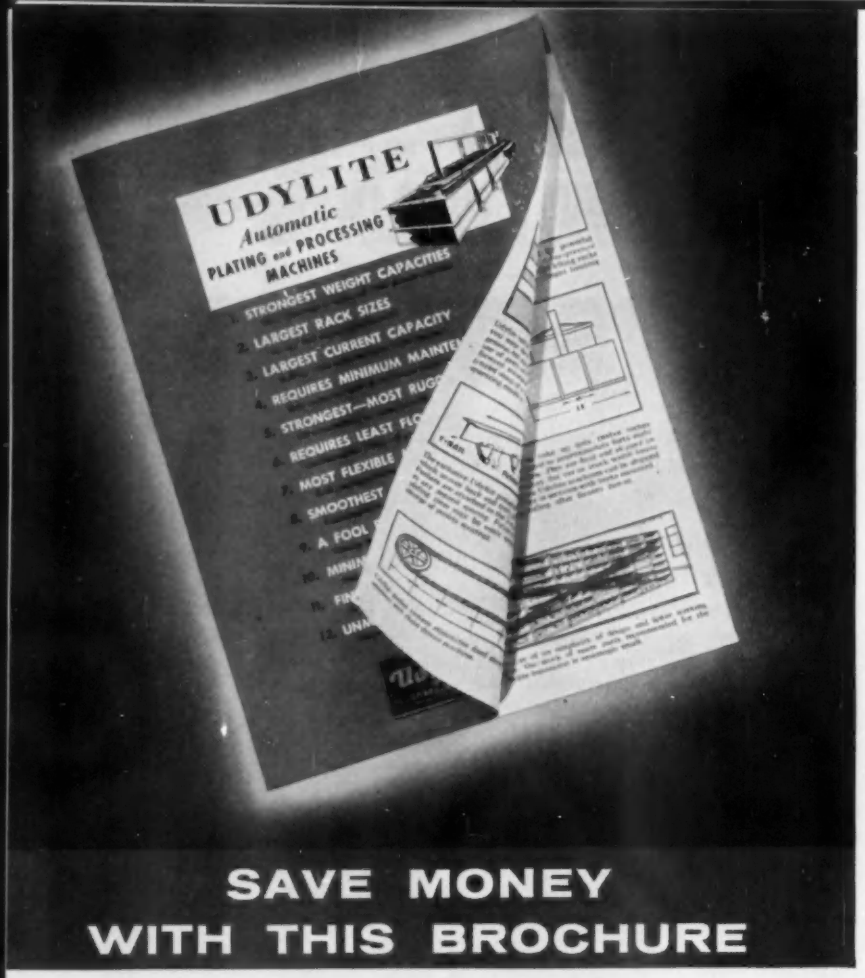
FLEXIBILITY OF FILLERARC SYSTEM is also demonstrated by the automatic head. It rotates 360 degrees, allowing even overhead welding. Arc is completely visible since gas is used as the shield instead of flux.



CIRCULAR OR SEAM WELDS may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc power sources, rectifier or motor-generator, and carbon dioxide combine for low-cost, quality welds on mild steel.

Progress Is Our Most Important Product

GENERAL ELECTRIC



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CALENDAR

OF COMING SHOWS AND MEETINGS

SAE National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif. .....Aug. 6-8
National Screw Machine Products Association, national sales conference, Wade Park Manor Hotel, Cleveland, O. .....Aug. 7-8
Institute of the Aeronautical Sciences, national turbine-powered air transportation meeting, Grant Hotel, San Diego, Calif. Aug. 15-17
Western Electronic Show and Convention, Los Angeles, Calif. Aug. 21-24
International Ignition Conference, sponsored by Scintilla Div. of Bendix Aviation Corp., Sidney, N. Y. .....Aug. 22-24
American Association of Motor Vehicle Administrators, annual conference, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada .....Aug. 28-31
National Aircraft Show, Oklahoma City, Okla. .....Sept. 1-8
Farnborough Air Show, England Sept. 3-9
Metal Powder Association, fall meeting, Homestead, Hot Springs, Va. .....Sept. 7-9
ASME Fall Meeting, Cosmopolitan Hotel, Denver, Colo. .....Sept. 10-12
SAE National Tractor Meeting and Production, Forum, Hotel Schroeder, Milwaukee, Wis. Sept. 10-13
American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago, Ill. Sept. 11-13
Packaging Machinery & Materials Exposition, Public Auditorium, Cleveland, O. ..... Sept. 11-14
National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 12-14
Instrument - Automation Conference and Exhibit, Coliseum, New York, N. Y. ..... Sept. 17-21
International Commercial Motor Transport Show, Earls Court, London, England .....Sept. 21-29
ASME Petroleum-Mechanical Engineering Conference, Conrad Hilton Hotel, Dallas Tex...Sept. 23-26
Trade Fair of the Atomic Industry, Navy Pier, Chicago, Ill.....Sept. 24-28
Atomic Industrial Conference Forum, Morrison Hotel, Chicago, Ill. .....Sept. 25-27
National Electronics Conference, Hotel Sherman, Chicago, Ill..Oct 1-3
SAE National Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif.....Oct. 2-6
Paris Automobile Show, France..Oct. 4-14
ASME - ASLE Third Lubrication Conference, Chalfonte-Haddon Hall, Atlantic City, N. J....Oct. 8-10
National Metal Exposition, Public Auditorium, Cleveland, O. Oct. 8-12
SAE National Transportation Meeting, Hotel New Yorker, New York, N. Y. .....Oct. 10-12
American Society of Body Engineers, annual convention, Rackham Bldg., Detroit, Mich...Oct. 17-19
International Motor Show, Earls Court, London, England...Oct. 17-27
National Industrial Exposition & Management Conferences, Artillery Armory, Detroit, Mich. Oct. 22-26

Another new development using

B.F.Goodrich Chemical *raw materials*

HYCAR AMERICAN RUBBER CAN BE TAILORED TO YOUR REQUIREMENTS

If this is your problem:

You need a flexible material that is highly resistant to aromatic fuels, oils and solvent. The answer is Hycar 1041, a high acrylonitrile copolymer rubber—used in oil well parts, fuel cell liners, fuel hose, gaskets, O-rings, cements and adhesives. —***Hycar*** 1041

Your product needs to stand up in the presence of water, while also offering good oil resistance. Hycar 1042, a medium acrylonitrile copolymer, gives this combination—extremely useful for shoe soles, kitchen mats, sink topping and printing rolls. —***Hycar*** 1042

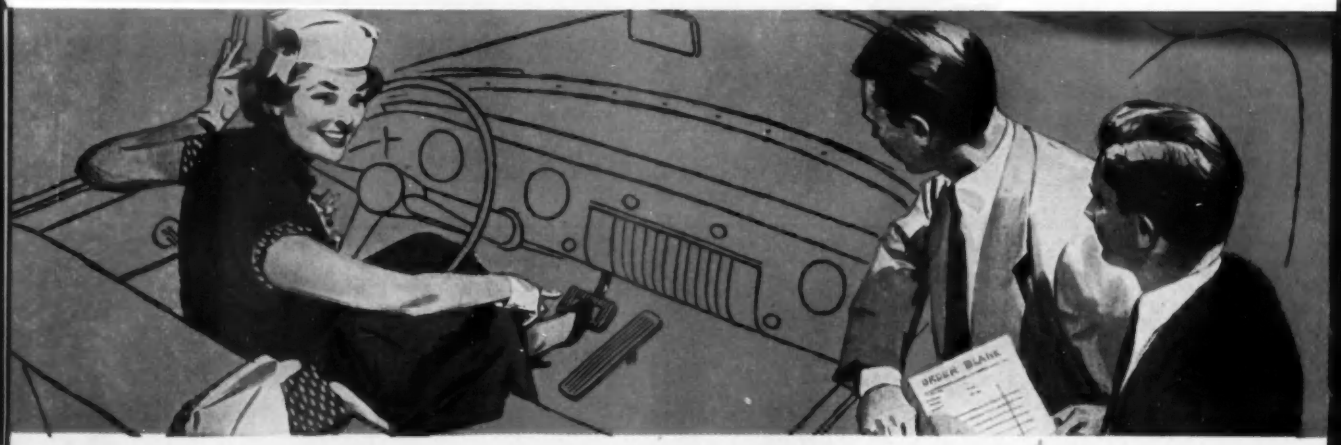
Or you must have a rubber that retains many of these other properties even at low temperatures. Hycar 1043 is a medium low acrylonitrile copolymer meeting these requirements, and easy to process. —***Hycar*** 1043

If low temperatures make your problem critical, Hycar 1014 may be the answer. It's a low acrylonitrile copolymer especially designed to emphasize this property. —***Hycar*** 1014

These are but a few of the many Hycar American rubbers that are tailored to meet specific requirements. Literature is available listing the properties of standard materials. For copies write Dept. EA-4, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
Reg. U.S. Pat. Off.
American Rubber

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors



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This industry-wide acceptance of the most revolutionary development in braking since Bendix four-wheel brakes is convincing evidence of Bendix foresight in research and engineering. And the fact that today more Bendix Power Brakes are in use than all other makes combined demonstrates conclusively the ability of Bendix to *produce* as well as to *plan ahead* for the industry's requirements.

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Bendix AVIATION CORPORATION

AUTOMOTIVE INDUSTRIES

BUSINESS DEPARTMENT

John C. Hildreth, Jr., Publisher
John F. Pfeffer, Asst. to Publisher
E. H. Miller, Advertising Mgr.
E. W. Hevner, Circulation Mgr.
John R. Flood, Market Research
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone SHerwood 8-2000

REGIONAL MANAGERS

CHICAGO—John T. Hoole
916 London Guarantee
and Accident Building
Chicago 1, Ill.
Phone FRanklin 2-4243

DETROIT—Melvin B. Nylund
1015 Stephenson Bldg.
Detroit 2, Mich.
Phone TRinity 5-2090

PHILADELPHIA and NEW YORK—
Nelson W. Sieber
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone SHerwood 8-2000
and
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

CLEVELAND—Richard P. Keine
730 National City Bank Bldg.
Cleveland 14, Ohio
Phone CHerry 1-4188

SAN FRANCISCO—
R. J. Birch and Frank W. McKenzie
300 Montgomery St.
San Francisco 4, Calif.
Phone DOuglas 2-4393

LOS ANGELES—L. H. Jackson
4055 Wilshire Blvd.
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High Spots of This Issue

★ **Flexible Controls for Body Conveyor, Painting Systems**

San Jose, Calif., is the site of the first Ford Div. assembly plant where the entire complex array of control equipment was designed prior to installation. This descriptive survey highlights its flexibility and ease of maintenance. Page 48.

★ **Bearing Races Drawn from Coil Stock Steel**

Strip steel is the material being used at the Pottstown, Pa., division of Dana Corp. to turn out bearing races for automotive joints. Detailed in the text and the accompanying illustrations are the procedures in the seven-step process. Page 52.

★ **Use of Die Castings in Cars Increases**

Automobiles equipped with automatic transmissions, power steering, and power brakes are using up to 150 lb of die castings per car. These and numerous other specific applications are analyzed in this authoritative market study of the subject. See Page 56.

★ **New Techniques for Automobile Frame Manufacture**

Cold bending of the front and rear sections is undoubtedly the most difficult operation to perform in the manufacture of the Chevrolet frame side rail. Discussed here are the techniques which have proven to be most practical for the task. Page 62.

★ **Multi-Spindle Air-Powered Tools in Automation**

First introduced through many operations in the automotive industries, multi-spindle production tools have given the spur to automation in many industrial plants. Presented here are a few "real life" examples of their essential role. Page 64.

★ **37 New Product Items**
And Other High Spots, Such As:

Die casting machines; utility tractors; Renault gas turbine car; Lockheed power steering unit; shaping sheet metal; welding lift truck forks; plastics production building; process has aircraft applications; overseas tractors; earth's atmosphere; machine tool cost analysis; and tooling setup for transmission gear blank.

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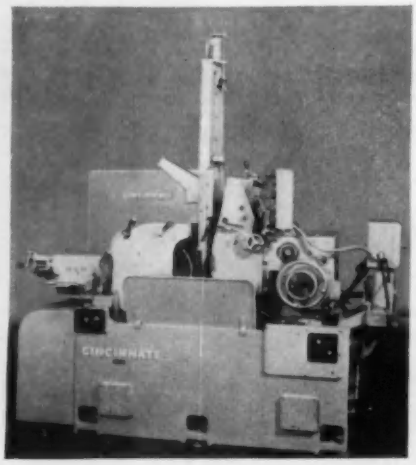
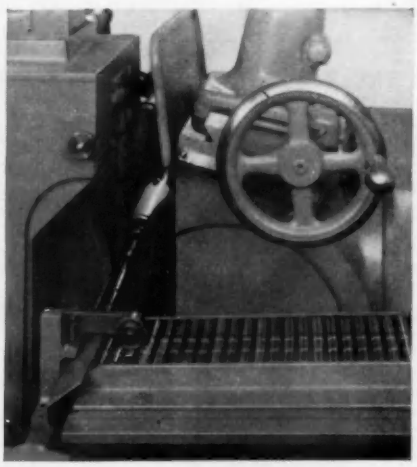
Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
• SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
• ENGINEERING • PRODUCTION • MANAGEMENT



Universal joint spiders. An ingenious loading device transfers the parts from one pair of wheels to the next. Four diameters are automatically ground each cycle. CINCINNATI® FILMATIC No. 2 Centerless Grinder.

Pump shafts. A magazine type work loading fixture and automatic infeed attachment help to reduce the cost of grinding bearing grooves. CINCINNATI FILMATIC No. 2 Centerless Grinder.

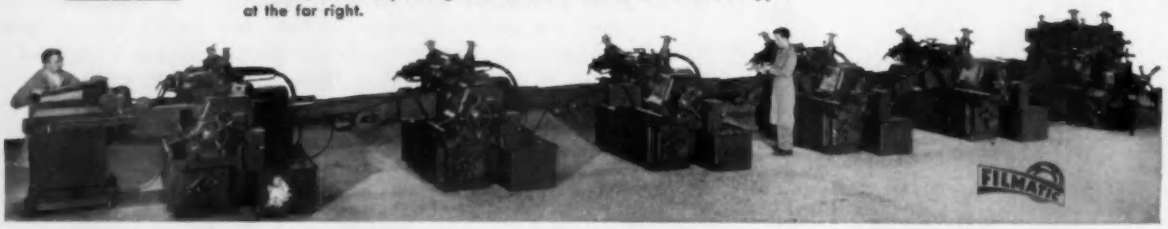


...and Cincinnati Centerless Automation
can reduce costs in your shop, too

Centerless grinding is a "natural" for automation. It can be developed to any degree required for your production, from a simple feed cycle to a complete line. Cincinnati Centerless grinding specialists have been doing this type of work for 33 years. That's one reason why it will pay you to consider Cincinnati first. Only Cincinnati can give you the advantage of long experience and a choice of *six sizes of centerless grinders*. May we hear from you?

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

Rocker arm shafts are loaded into the hopper at the left and transferred by conveyor from one CINCINNATI FILMATIC No. 2 Centerless to the next, and finally through the CINCINNATI FILMATIC Centerless Lapper at the far right.



Automotive valves. Parts are received from an overhead conveyor and automatically ground at the rate of 22 per minute. CINCINNATI FILMATIC No. 2 Centerless Grinder.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 115, No. 3 August 1, 1956

Thompson Licensed To Make Bosch Fuel Injection Unit

Thompson Products, Inc., has joined up with American Bosch Arma Corp. in promoting a fuel injection system developed by the latter company. Under a licensing agreement with American Bosch, Thompson will manufacture and sell the units in the after-market, and explore the original equipment market among car companies. Both concerns will share tooling costs for the fuel injection equipment.

Although interest in fuel injection is growing, it is somewhat doubtful that it will appear on any of the 1957 cars and certainly not on the lower-priced models. American Bosch estimates its fuel injection system would cost a fair amount above that of the standard carburetor on present cars.

Ransburg to Expand Greatly Its Indianapolis Facilities

Plans for a million-dollar building and expansion program have been announced by Ransburg Electro-Coating Corp. Construction of the new, single-story building, which is to be located at 4000 West 56th St., Indianapolis, Ind., will get underway before the year's end and is expected to be completed late in 1957.

The new 80,000 sq ft building will house the administrative, sales, and engineering offices. The plant area of 150 by 330 ft will house the engineering and test laboratories, manufacturing, and warehouse.

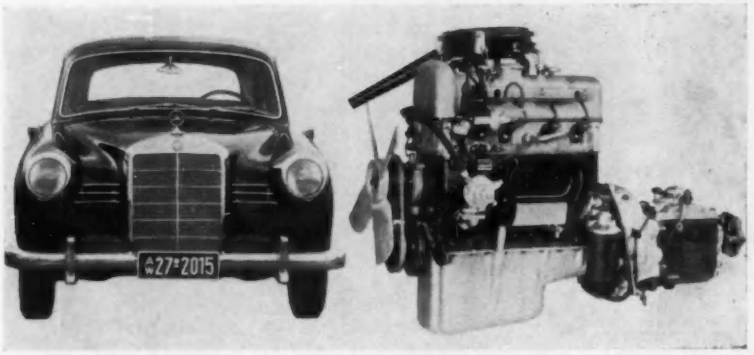
New Jobless Pay Plan Is Approved By Ohio

Approval by Ohio of a "substitute" supplemental unemployment benefit plan for Eaton Manufacturing Co. may pave the way for setting up a similar program at other companies in that state. Ohio has outlawed the original SUB plan now in force in other states.

The substitute plan, similar in principle to the SUB plan, sets up a "savings account" for each employe. The company contributes to the fund on the same basis as it would under original SUB provisions. In the case of Eaton, it is 3½ cents an hour for each employe.

Biggest advantage of the new plan, called the "individual income security program," is that it circumvents the various state laws in Ohio, which nullified the SUB program. Money contributed into the fund is not classified as "earnings."

Hence, a worker can collect both his maximum state unemployment benefits and money from the "savings" fund simultaneously when he is laid off. Under the Ohio law, money contributed to the SUB trust fund is considered income, and has to be deducted from state unemployment benefits received by unemployed persons.



MERCEDES-BENZ PRESENTS FOUR-CYLINDER 190 CAR

Among recent new additions to the Mercedes-Benz passenger car series is the 190 four-cylinder model. Perhaps best described as a refined version of the 180 model, it is powered by an overhead camshaft engine that is a modified counterpart of that used in the 190 SL sports roadster. Compression ratio is 7.5 to 1; displacement is 104 cu in., and maximum output is in the neighborhood of 84 bhp at 4800 rpm.

Latest Air Force Contracts To Industry Top $39 Million

Contracts awarded to industry in recent weeks reflect the upward trend in defense spending by the Government, which is now running at the rate of approximately $100 million per day. Latest contracts awarded by the Air Material Command of Wright-Patterson Air Force Base total more than $39 million. These will be shared by nine concerns.

Largest award, totaling $14.2 million, will go to the AC Spark Plug Div. in Flint, Mich., for ME-5 bombing navigational computers. In addition, the GM division also won a $1.1 million order for spare parts for the computers. The Allison Div. at Indianapolis was awarded $5.9 million to overhaul J-71 engines.

Bendix Aviation Corp., Teterboro, N. Y., was awarded $1.2 million for vertical gyro controls and spare parts. The company's South Bend, Ind., facilities got $1.1 million for additional spare parts for aircraft wheels and brakes.

News of the AUTOMOTIVE

LOW-SLUNG MASERATI SPORTS CAR SEATS TWO

The new Maserati International 300/S two-seater sports car is built on a wheelbase of 90 in. Power plant is a six-cylinder gasoline engine with a compression ratio of 8.75 to 1 and an output of 245 bhp at 6200 rpm, according to specifications.

Goodrich Grants SUB Plan To Rubber Workers Union

B. F. Goodrich Co. becomes the first of the large rubber manufacturers to reach an agreement on a new contract with the United Rubber Workers Union. In addition to a 6.2-cent-an-hour pay increase, the new pact, which expires April 1, 1957, incorporates a supplemental unemployment benefit plan, the first to be approved by a rubber company.

It is almost certain that other rubber companies will follow the pattern set by Goodrich, including Goodyear Tire & Rubber Co., Firestone Tire & Rubber Co., U. S. Rubber Co. and Seiberling Rubber Co They are still negotiating with the union

While still not finalized, the SUB plan, it is understood, will be similar in principle to that now in effect in the automobile industry. Goodrich reportedly will contribute three cents an hour toward the plan. At press time, Goodyear signed a similar pact.

1956 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

	May				Five Months			
	1956		1955		1956		1955	
Price Group	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under $2,000	107,627	19.48	360,608	54.89	473,721	18.83	1,532,452	53.80
$2,001 to $2,500	289,290	52.40	205,872	31.34	1,383,257	54.97	895,210	31.42
$2,501 to $3,500	132,960	24.06	71,535	10.90	554,569	22.04	335,256	11.7/
Over $3,500	22,378	4.05	18,860	2.87	104,609	4.16	85,838	3.01
Total	552,145	100.00	656,975	100.00	2,516,156	100.00	2,848,756	100.00

Dollar Volume of Sales

	May				Five Months			
	1956		1955		1956		1955	
Price Group	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under $2,000	$ 211,686,541	16.35	$ 683,916,663	47.41	$ 925,957,799	15.72	$2,909,595,139	46.19
$2,001 to $2,500	621,240,984	47.97	480,121,765	33.28	2,980,273,403	50.57	2,085,734,035	33.16
$2,501 to $3,500	365,105,253	28.20	202,135,622	14.01	1,538,888,400	26.12	951,506,150	15.10
Over $3,500	96,833,717	7.48	76,465,690	5.30	447,022,040	7.59	349,534,906	5.55
Total	$1,294,876,495	100.00	$1,442,638,740	100.00	$5,892,142,842	100.00	$6,296,670,231	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Chrysler's Share Of Sales Drops Slightly From 1955

Although Chrysler Corp.'s share of the retail automobile market in the first six months of this year dropped under the same period last year, it was slightly ahead of the final six months of 1955. The company estimated its market share in the January-June period amounted to 16.4 per cent, compared with 16 per cent in the last six months of last year. During the first six months of last year, the corporation held 18.2 per cent of the industry market.

Production has closely paralleled sales. From last October through the end of June, output averaged 16.5 per cent of U. S. automobile production, chiefly as a result of a production cutback last December. The company says that sales in the past several months have been exceeding production, thus reducing inventories.

Pontiac Installs New System For Priming Sheet Metal Parts

A new system for applying prime coat to sheet metal parts has been installed by Pontiac in its expanded car assembly plant. Under the new method, the parts are "bonded" and prime-coated on the same conveyor which carries the parts to the bake ovens. The new system replaces the old method under which parts were dipped into a tank for priming.

Some 80 nozzles are used to spray the bonding chemical and primer on the parts, which move through a drip area and into 1000-ft-long baking ovens. A safety factor is provided with the new method, since it eliminates open tanks of prime paint.

Motor Products Canada Unit Sold To Investment Concern

Masters, Smith & Co., Ltd., an investment firm, has purchased the Canadian division of Motor Products Corp., located in Windsor, Ont. Purchased for a reported price of $4 million, the division will be reincorporated as a Canadian company to be known as Motor Products Corp. of Canada, Ltd.

AND AVIATION INDUSTRIES

Ford's New Subsidiary Sets Up Headquarters

Aeronutronic Systems, Inc., new subsidiary formed by Ford Motor Co. earlier this year, has set up temporary headquarters in the Grand Central Terminal buildings, Glendale, Calif. The structures have been leased until a permanent site for the new company is located. The subsidiary will occupy all of the terminal facilities, which formerly served the Glendale Airport, including the engineering building.

Besides the Glendale quarters, the subsidiary will continue to use offices at Van Nuys, Calif., former home of Systems Research, Inc., which was absorbed by the Ford subsidiary. The terminal buildings will house Aeronutronic administrative offices and equipment for a new product program. A permanent site in the vicinity of Los Angeles is being considered by the company.

Eaton To Expand Operations In Cleveland By 35 Per Cent

Eaton Manufacturing Co. will expand manufacturing space at Cleveland by about 35 per cent with the addition of a new two-story building. To be located adjacent to the company's present heater division plant, the new $860,000 unit will provide increased production for several products and save costs through eliminating present warehousing and other handling functions.

Kelsey-Hayes Acquires Utica Drop Forge Tool

Acquisition of Utica Drop Forge Tool Corp., Utica, N. Y., by Kelsey-Hayes Wheel Co. of Detroit is another move in line with the company's program to diversify its products in the aircraft and automotive fields. Kelsey-Hayes acquired the company through purchase of all outstanding stock for an undisclosed amount.

No change in management is planned at present for the Utica firm, which employs about 3000 persons. Earlier this year, Kelsey-Hayes acquired Steel Products Engineering Co. of Springfield, O.

CZECH TRUCK

Tatra 2¼-ton truck is intended for both military and commercial uses. Of cab-over engine design, it is powered by an aircooled V-8 engine of 153 cu in. displacement. Output in this application is 75 bhp at 4200 rpm. Power is transmitted through a four-speed gearbox and two-speed transfer case to front and rear differentials.

GM Bus Suit Threatens Creed of Free Enterprise

Some interesting questions are raised by the Government's anti-trust suit against General Motors charging monopoly in the bus business. Among the requests for injunctive relief asked by the Justice Dept. is one that would prohibit GM from supplying more than 50 per cent of the bus needs of certain large bus operators who are named as co-conspirators.

The foregoing point immediately raises the question of free customer choice, since these specified operators would then be forced to buy half their needs from companies other than GM whether they want to or not. They no longer would have free choice in specifications and would necessarily limit their business to the few remaining bus companies, regardless of whether the product met their particular needs.

The Government also asks that GM terminate all restrictive agreements relating to bus manufacture; make available to all applicants any patents controlled by GM that relate to bus manufacture; extend to all who want it the financing facilities of GM's Yellow Manufacturing Accep-

FIVE-MONTH TOTAL EXCEEDS 1955 BY GOOD MARGIN

1956 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1956 Five Months' Totals

MAKE	May 1956	April 1956	May 1955	FIVE MONTHS Units 1956	Units 1955	Per Cent of Total 1956	Per Cent of Total 1955
Chevrolet	28,455	27,531	29,583	126,710	105,315	33.65	30.60
Ford	25,304	25,073	24,630	110,969	115,999	29.48	33.70
International	10,267	9,950	8,345	45,717	42,145	12.14	12.25
G. M. C.	7,889	7,516	6,969	36,383	24,356	9.66	7.08
Dodge	5,844	5,078	5,214	23,671	25,959	6.29	7.54
White	1,484	1,540	1,173	6,765	5,376	1.80	1.56
Mack	1,269	1,251	1,061	5,494	3,941	1.46	1.15
Willys Truck	1,177	1,285	1,361	5,399	6,651	1.43	1.93
Studebaker	915	857	1,061	4,310	4,803	1.14	1.40
Willys Jeep	780	717	785	3,295	3,809	.88	1.11
Diamond T	381	386	312	1,729	1,405	.46	.41
Divco	312	309	346	1,407	1,326	.37	.39
Reo	289	293	232	1,234	1,050	.33	.31
Kenworth	127	109	93	497	399	.13	.12
Brockway	99	128	85	436	451	.12	.13
Peterbilt	64	55	48	214	169	.06	.05
F. W. D.	44	37	22	189	97	.05	.03
Misc. Domestic	81	138	61	447	286	.12	.08
Foreign	296	446	157	1,620	565	.43	.16
Total—All Makes	84,987	82,099	82,086	376,508	344,106	100.00	100.00

* Based on data from R. L. Polk & Co.

tance Corp.; and sell to anyone at non-discriminatory prices and terms the buses and bus parts it makes.

Subsidized Competition Seen

If all of these Government requests are granted, GM obviously would be in the position of subsidizing its competitors by making available to them the engineering developments and patents which it has acquired at considerable expense over the years. It also would be required to provide such components as engines, transmissions, and suspensions to competitors at a "non-discriminatory price." This presumably would be the same cost which GM charges itself for these elements which go into coach manufacture.

All of these restrictive provisions sought by the Justice Dept. raise the question of whether they actually encourage competition or decrease it in the bus industry and whether they ultimately serve any useful purpose to the bus operator and the public.

The nature of the injunctive action sought indicates the Justice Dept. has prejudged GM to be guilty of illegal action in attaining its dominant position in the bus industry by accounting for about 85 per cent of the annual business. Actually, that would seem to be a matter to be determined by the courts. If any illegal action is discovered, it could then be enjoined by court action.

However, to divest GM arbitrarily of a specified percentage of market penetration and/or to require it to make parts available to competitors at the same prices it pays, together with patent rights, appears to be a clear-cut attempt to allocate the market, regardless of competitive ability of the various companies.

General Motors, naturally, is reluctant to comment on the case. President Harlow H. Curtice did issue a statement to the effect that the company's position is due to superior management and product design. It seems likely that this will be the principal defense GM will make.

Indication of Things to Come?

The suit has an interesting significance in that the issues involved might well be the same as those that conceivably could arise sometime in the future in connection with GM's position in the passenger car field. The Justice Dept. has indicated that it still is investigating on that score also. The outcome of the bus antitrust suit may well indicate whether the Government at some time in the future might take action against GM for its leading role in the passenger car business on the basis of bigness alone.

1956 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

	For Weeks Ending				Total Jan. 1 to July 21, 1956
	July 21	July 14	July 7	June 30	
PASSENGER CAR PRODUCTION					
Hudson	351	242	165	338	19,047
Nash	980	1,040	850	1,201	45,445
Total—American Motors	1,336	1,282	1,015	1,539	64,492
Chrysler and Imperial	2,538	2,775	2,217	2,611	72,283
De Soto	1,940	2,041	1,521	1,893	62,572
Dodge	4,197	4,224	3,422	4,286	120,388
Plymouth	9,518	9,038	7,080	8,270	269,203
Total—Chrysler Corp.	18,193	18,078	14,240	17,060	524,446
Ford	28,542	28,719	19,194	26,231	777,956
Lincoln and Continental	1,133	1,082	983	927	31,674
Mercury	6,307	5,999	4,025	5,499	155,212
Total—Ford Motor Company	35,982	35,800	24,212	32,657	964,842
Buick	9,999	9,876	3,995	7,275	345,641
Cadillac	3,216	3,218	1,027	2,597	91,837
Chevrolet	30,120	29,356	16,621	29,999	954,999
Oldsmobile	8,125	7,975	3,831	6,757	272,172
Pontiac	5,664	5,652	2,270	5,137	295,168
Total—General Motors Corp.	56,724	56,077	27,644	51,725	1,968,807
Packard	0	0	36	61	13,289
Studebaker	1,181	1,527	596	120	49,848
Total—Studebaker-Packard Corp.	1,181	1,527	632	181	63,137
Checker Cab	119	100	82	111	1,989
Total—Passenger Cars	113,535	1,627	67,825	103,273	3,567,713
TRUCK PRODUCTION					
Available	3	0	1	.....	219
Chevrolet	6,924	7,126	1,925	5,467	212,278
G. M. C.	1,539	1,546	617	1,665	55,139
Diamond T	105	110	53	96	2,539
Divco	80	0	0	80	2,259
Dodge and Fargo	2,111	1,821	1,576	1,867	51,207
Ford	6,074	6,188	3,909	6,269	176,956
International	2,374	2,109	1,679	2,371	79,519
Mack	308	298	219	508	10,489
Marmon-Herrington	25	22	15	25	323
Reo	78	76	32	78	2,129
Studebaker	412	341	219	120	8,829
White	369	333	271	367	10,784
Willys	1,167	1,381	851	1,390	34,502
Other Trucks	150	138	95	121	4,343
Total—Trucks	21,719	21,437	11,482	20,244	651,815
Buses	83	106	23	109	2,501
Total—Motor Vehicles	135,342	134,407	79,340	123,626	4,242,029

New York Air Brake Notes Sharp Increase In Orders

Impact of the recently approved U. S. road-building program on many manufacturers of construction equipment and related industries is illustrated in a report from the New York Air Brake Co. Orders from makers of road building machinery and material handling equipment are increasing steadily and beyond expectations, the company reports. As of June 30, unfilled orders totalled more than $21 million, about $2 million more than for the entire year of 1955.

AND AVIATION INDUSTRIES

FIERY MAGNETIC MATERIAL

Scientists at Westinghouse Electric Corp. have perfected a magnetic material that promises to yield more powerful new permanent magnets. The material is virtually 100 per cent pure manganese-bismuth that bursts into a fiery "waterfall" when scattered in air. The finely ground powder must be prepared and processed in an inert atmosphere of helium gas.

Willys Gets Production Order For Army's "Mechanical Mule"

Willys Motors has received a $3.5 million contract for production and engineering of the Army's new lightweight tactical vehicle, the "Mechanical Mule." The vehicle will be produced at the company's Toledo plant, and tooling is scheduled to start immediately.

Designed primarily as a cargo carrier, the Mule has the lowest silhouette (27 in.) of any military vehicle and is light enough to be carried by a helicopter or dropped from an airplane by parachute. First deliveries of the Mule are scheduled to be made within a year to the Army's 101st Airborne Division.

Sept. 30 Is Deadline For Plastics Contest

Cadillac Plastic and Chemical Co. has announced that the deadline for entries in the company's design contest is Sept. 30. Offering nearly $2000 in prizes, the contest is being sponsored by the company to encourage the design professions' awareness of the adaptability, versatility and variety of thermoplastic rods and tubes.

AI TABLOID

Electric Auto-Lite Co. has acquired an interest in the firm Cia Acumuladores Prest-O-Lite of Brazil.

* * *

Ford Motor Co. has consolidated the Continental and Lincoln Divs. into one unit called "Lincoln Div."

* * *

International Harvester Co. is offering two new rear-dump trucks of 18 and 24 tons capacity, respectively.

* * *

Superior Tube Co. has created a Nuclear Products Div. . . . Hupp Corp. has formed a new Aviation Div.

* * *

Robert Bosch GmbH recently turned out its two millionth fuel injection system.

* * *

Firestone Tire & Rubber Co. now has tires available for use on 13-in. rims.

* * *

The new Convair Golden Arrow commercial airliner, scheduled to go into servcice late in 1959, will be powered by four CJ-805 jet engines. The CJ-805 is the commercial version of the GE-J79.

* * *

The Iroquois jet engine will soon go into production at the A. V. Roe plant at Malton, Ont.

* * *

Sintox Corp. is building a sizable plant near Allentown, Pa., for output of a new synthetic material. It is said to have a wide variety of applications in automotive and aircraft production, machining of metal, in the electrical and electronic fields, and in the manufacture of plastics.

Mack Trucks, Inc., is now producing an improved fire apparatus engine, with a sizable boost in horsepower and torque.

* * *

Detroit Gear Div. of Borg-Warner Corp. has been added to Long Manufacturing Div. as a separate manufacturing unit.

* * *

Planet Corp. will construct an addition to its factory that will increase its manufacturing space by over 50 per cent. . . . Formsprag Co. is constructing an addition doubling its present plant capacity.

* * *

Lockheed Aircraft Corp. has begun transferring its nuclear aircraft program from California to Georgia.

* * *

Vickers, Inc., has set up a new West Michigan Branch of its Detroit regional sales office for industrial products at 946 Cherry St., S. E., Grand Rapids, Mich.

* * *

Consolidated Electrodynamics Corp. has acquired Electronic Industries, Inc. . . . National-U. S. Radiator Corp. has acquired the Air Conditioning Div. of Union Asbestos & Rubber Co.

* * *

Bell Aircraft Corp. reportedly plans to convert its $23 million helicopter manufacturing division in Ft. Worth, Tex., into a big new subsidiary company.

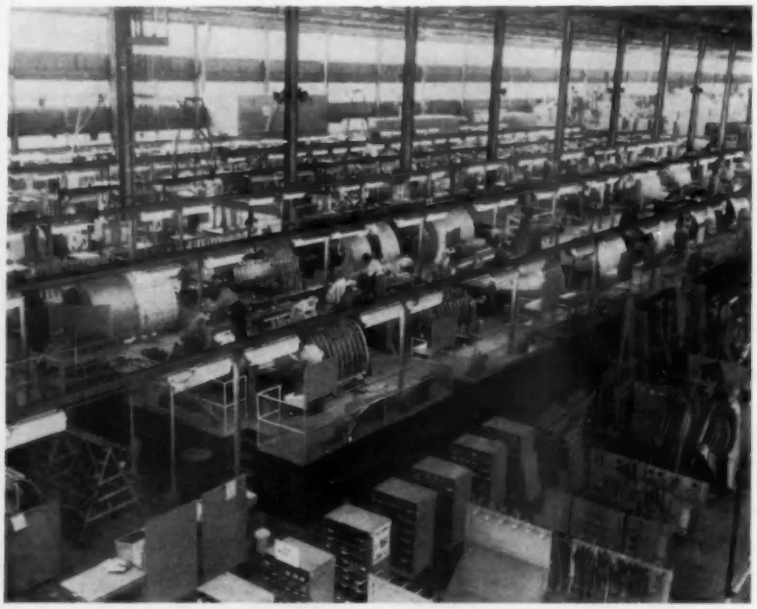
* * *

Clark Equipment Co. has proposed a system for transporting jet airline passengers from terminal to plane. The system uses a "passenger pod" conveyance and a Clark-Ross straddle carrier.

* * *

Humphreys Manufacturing Co. is expected to merge with Borg-Warner Corp.

News of the AUTOMOTIVE



IN-LINE HANDLING SAVES BOTH TIME AND STEPS

Rehandling of many small parts is reduced and much production time is said to be saved by the in-line stocking method employed on the F-102A interceptor program at Plant II of Convair Div. of General Dynamics Corp., San Diego, Calif. Components, fasteners, and other materials needed for construction of fuselage quarter sections are stocked adjacent to the assembly area (foreground), rather in a central parts storage area. Parts are identified by number, and workmen go directly to nearby bins to select parts they need. Quarter sections being assembled here are later mated into right and left half sections and finally into the completed center barrel section of the plane. After installation of some primary equipment, the center sections are sent to major fuselage mate area to meet other components.

ITALIAN TRANSPORT TRUCK FEATURES VERSATILITY

Fiat-OM 6600 transport truck has three axles with single tires on the front axle and double tires on the two rear ones. Powered by a 210-hp engine, the cargo carrier is suitable for use in hilly country and where extremes of temperatures are found.

Buick Notes 50% Increase In Sales Of Air Coolers

Sales of automobile air conditioners continue to head upward. An illustration of the market growth for the air coolers in the past year is a report from Buick Div., which shows that 19,000 cars were equipped with the units during the first six months of this year. This is an increase of nearly 50 per cent above the same time last year.

The company estimates that more than 30,000 air conditioners will be installed on Buicks this year, compared with 21,000 in 1955. Of the total units sold in the first half, about 75 per cent of them were installed at the factory. This would indicate that most buyers are requesting the units when purchasing the car.

Brooks and Perkins To Build New Magnesium Plant in Ala.

Announcement of plans to build a $7 million plant in Selma, Ala., adding 15 per cent to this country's magnesium commercial production total, has been made by Brooks and Perkins, Inc. Options have been taken on 480 acres on the Alabama River, 50 miles west of Montgomery, and the plant probably will be in operation in 1957 with substantial production underway in the last quarter of that year.

Brooks and Perkins and Dominion Magnesium, Ltd., of Toronto, will be in joint ownership of the new high-purity magnesium corporation — the Alabama Metallurgical Corp. The plant will have a rated annual production capacity for high-purity magnesium of 10,000 tons.

Engineering Educators Observe Progress Of "Students" At GM

Engineering professors from 20 colleges last month had a first-hand look at how industry utilizes the engineers they have been training at a 17-day conference sponsored by General Motors. In addition to exchanging mutual information with company engineers, the educators visited various GM operating divisions, the Technical Center and the General Motors Institute in Flint to observe engineers.

AND AVIATION INDUSTRIES

United Specialties Drops Parts Making In Chicago

Production of automotive parts will be discontinued at the Chicago plant of United Specialties. The company admits it has been having a difficult time during the past two years, and has been diversifying its activities to improve its market position.

Car Makers Start Revamping Plants for '57 Model Output

While the first of the 1957 models are not expected to be introduced for at least another two months, plant changeover operations are underway. Shutdowns this year are expected to be more prolonged than last year. Basic reasons are to pare inventories as much as possible before the 1957 season gets started and to permit more leeway for possible last-minute changes on restyled models for next year.

Ford became the first of the Big Three car companies to start shutting down its plants late last month. Downtime will be staggered at various plants throughout this month and part of September. Chrysler Corp. will start going down at the end of this month for various periods.

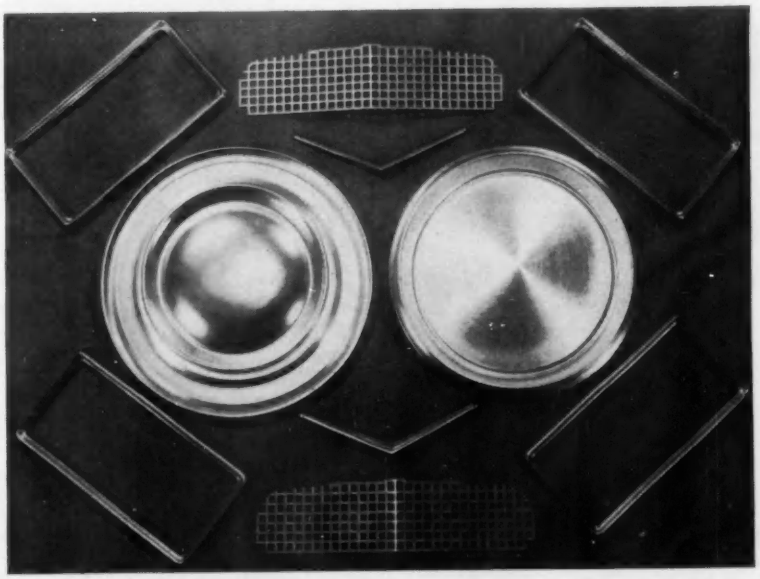
General Motors did not say when it plans to shut down, but indications were that all divisions probably would start changing over no earlier than September. One GM division is scheduled to end its 1956 model run the last week of September.

American Motors ended production of Nash and Hudson cars early last month (July). Rambler output is scheduled to phase out the beginning of this month.

Car sales in June and July continued at a steady pace. While far from spectacular, they rose appreciably enough to reduce stocks.

Some industry sources estimate current new car inventories in the neighborhood of 550,000 units. This is a sharp decrease from the record 900,000 earlier in the year.

Further cutbacks in production in the third quarter and complete shutdowns by individual plants for various periods should drop inventories markedly in the July-September period. Stocks of many car dealers already are under their normal levels, and it will not be surprising to find showroom floors cleaned out completely just prior to the arrival of 1957 cars.



CAR PARTS FABRICATED FROM GOLD ALUMINUM ALLOY

A variety of decorative automobile parts have been fabricated from a new gold aluminum alloy developed by Kaiser Aluminum & Chemical Corp. Shown above are two types of wheel covers, grilles, Vees, and license plate frames. Fabricated from sheet of the new alloy, by processes and on dies regularly used by their fabricators, they were then anodized by Kaiser's Dept. of Metallurgical Research to bring out color.

CHEVROLET, FORD REMAIN MARKET PACESETTERS

1956 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1956 Five Months' Totals

MAKE	May 1956	April 1956	May 1955	FIVE MONTHS Units 1956	FIVE MONTHS Units 1955	FIVE MONTHS Per Cent of Total 1956	FIVE MONTHS Per Cent of Total 1955
Chevrolet	147,942	146,515	149,948	656,560	583,411	25.76	20.89
Ford	123,114	123,940	137,192	548,037	600,913	21.36	21.15
Buick	50,770	53,027	71,250	248,134	311,806	9.74	10.96
Plymouth	46,841	45,977	62,653	214,294	280,239	8.41	9.87
Oldsmobile	42,089	42,533	53,637	198,640	236,781	7.79	8.34
Pontiac	33,012	34,952	48,748	160,649	215,732	6.30	7.59
Mercury	26,417	26,943	34,350	116,281	142,208	4.64	5.01
Dodge	20,855	20,585	26,498	92,797	120,965	3.64	4.26
Cadillac	13,539	13,499	12,922	61,376	62,317	2.41	2.19
Chrysler	11,221	11,606	14,874	52,242	70,230	2.05	2.47
De Soto	9,712	9,927	11,195	44,527	51,894	1.75	1.82
Studebaker	7,382	8,137	9,596	38,119	43,700	1.50	1.54
Nash	7,670	8,007	10,085	35,449	36,626	1.39	1.29
Lincoln	4,144	4,087	3,042	18,021	12,287	.71	.43
Hudson	3,694	3,202	4,786	15,517	18,769	.61	.66
Packard	3,363	3,121	5,533	15,009	21,453	.59	.76
Continental	132	150	.....	832	.....	.03	.....
Misc. Domestic	431	407	800	1,357	4,681	.05	.16
Foreign	7,716	7,567	4,195	31,870	16,801	1.25	.59
Total—All Makes	560,014	564,272	661,304	2,548,710	2,840,532	100.00	100.00

* Based on data from R. L. Polk & Co.

Men in the News

McQuay-Norris Manufacturing Co.—Noble H. Hale has been appointed manager of advertising and sales promotion.

American Chemical Paint Co. — **Leon Cherksey** is now chairman of the board, and **Gerald C. Romig** succeeds him as president.

Ethyl Corp.—**Edward L. Shea** and **B. Bynum Turner** have been elected chairman of the board and president, respectively.

General Motors Corp—**Edward N. Cole, Semon E. Knudsen,** and **Herman F. Lehman** have been elected vice-presidents.

B. F. Goodrich Co.—**J. W. Keener** and **Arthur Kelly** have been elected executive vice-presidents.

Colonial Broach & Machine Co.— **Charles H. Crawford** and **W. W. Wood** have been elected vice-presidents.

Jervis B. Webb Co. of California— **Jack Peters** has been appointed general manager.

Hayes Steel Products, Ltd.—**Von Kaufman** has been appointed vice-president and general manager.

Chevrolet Motor Div., General Motors Corp.—**R. F. Sanders** has been named assistant chief engineer in charge of passenger car chassis design; **H. H. Schroeder,** assistant chief engineer in charge of passenger car and truck body design; and **M. S. Rosenberger,** assistant chief engineer in charge of experimental test operations.

White Diesel Engine Div., White Motor Co.—**C. E. Douglas** has been appointed controller.

Yale & Towne Manufacturing Co.— **Robert L. Brown, Jr.,** has been named electric truck sales manager.

Clark Equipment Co., Axle Div. — **L. M. Gray** is now chief engineer; **G. C. Vanderberg,** engineering consultant; and **William E. White,** new development engineer.

Super Tool Co.—**Kenneth R. Fisher** has been appointed president.

Cleveland Worm & Gear Co. and Farval Corp.—Henry H. Platek and Karl A. Krantz have been named advertising manager and purchasing agent, respectively.

Dodge Manufacturing Corp.—**Carl W. Petersen** was named executive vice-president; **Earl Wedlake,** vice-president in charge of production and purchasing; and **Karl D. Jahnke,** secretary and treasurer.

Chrysler Corp. of Canada, Ltd. — **C. Allan Foran** was made assistant to the executive vice-president.

Stran-Steel Corp.—**R. L. Huey** has been promoted to controller.

Chevrolet Motor Div., General Motors Corp. —E. J. Premo is now executive assistant chief engineer.

Aeronutronic Systems, Inc.—**Ernest R. Breech** was elected chairman of the board, while **Del S. Harder** and **John S. Bugas** were elected directors. **Edward L. Montgomery** was made secretary.

L. O. F. Glass Fibers Co., Future Planning Div.—**Herbert A. Fox** is now director.

American Bosch Arma Corp., Chicago Div.—**Ernest M. Riggelman** has been appointed division manager.

Russell, Burdsall & Ward Bolt and Nut Co.—**James S. Dill** is now assistant to the vice-president for sales.

Minnesota Mining & Manufacturing Co., International Div.—**Maynard H. Patterson** has been named vice-president and general manager, and **Kenneth J. Shea** has been made vice-president and general manager of the Canadian subsidiary.

American Motors Corp. — Fred W. Adams was appointed director of automotive advertising and merchandising.

GMC Truck and Coach Div., General Motors Corp.—**R. H. Gillespie** has been appointed fleet sales manager.

Stewart Warner Corp., South Wind Div.—**W. D. Lannin** is now sales manager for commercial products.

Pontiac Motor Div., General Motors Corp.—**Benjamin A. Kissam** has been appointed assistant general sales manager.

Buda Div., Allis-Chalmers Mfg. Co. —**J. C. Baseheart** and **F. M. Borwell** are now engine sales manager and assistant sales manager, respectively.

Necrology

William B. Peirce, 78, past president of the American Society of Tool Engineers, died July 4, at Pittsburgh, Pa.

Stephen L. Ingersoll, 61, president of Ingersoll Steel Div. of Borg-Warner Corp., died July 22, at Chicago, Ill.

Gilbert E. Mack, 50, owner of the Mack Trailer and Truck Manufacturing Co., died July 3, at Detroit, Mich.

Anthony Taddeo, 66, founder and president of T. T. Bearing Co., died July 10, at Rochester, New York.

William B. Preston, 81, retired traffic manager for General Electric Co., died July 14, at Pittsfield, Mass.

Philip Arnold, 73, retired vice-president of Garlock Packing Co., died July 3, at Carmel, Calif.

Burton A. Becker, 89, pioneer automotive manufacturer of the old Elmore car, died July 9, at Sandusky, Ohio.

Where precision counts . . . count on Texaco

Typical machining operation at Cummins Engine Company, Columbus, Indiana. An emulsion of *Texaco Soluble Oil CX* is used here, and has proved highly satisfactory in assuring efficient, low-cost production.

In machining parts for the famous Cummins high speed, light weight diesel engines, tolerances are close, finish must be perfect, rust cannot be tolerated. So it is significant that Texaco supplies cutting fluids for this work. For example, where a soluble oil emulsion is needed, Cummins uses *Texaco Soluble Oil CX* and consistently enjoys these benefits:

More Stable Emulsions: *Texaco Soluble Oil* emulsions remain stable even under the most adverse conditions, assure highest cutting efficiency.

Rust-Free Finish: With a *Texaco Soluble Oil* emulsion, finish on machined parts is uniformly smooth and rust-free.

Longer Tool Life: *Texaco Soluble Oil* emulsions effectively reduce wear on tools, keep them sharp for extra-long periods between regrindings.

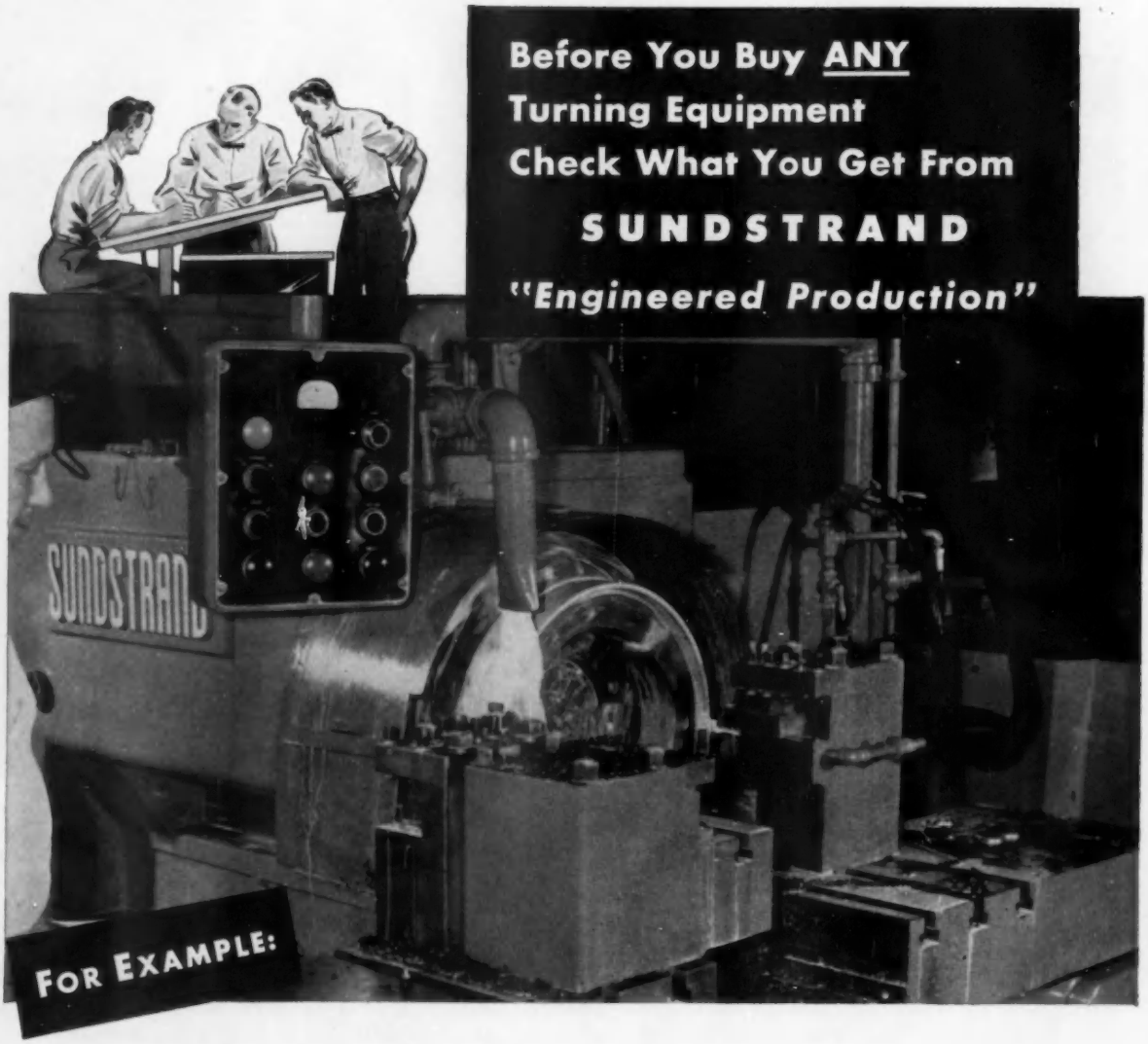
Operators everywhere get similar results when Texaco is on the job. There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. A Texaco Lubrication Engineer will be glad to help you select the proper ones for your operation.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS



This Sundstrand Automatic Lathe Increased Production 3 Times

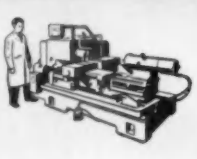
Here's a Sundstrand Model 16 Automatic Lathe that increased production of inner and outer bearing races an average of three times compared to the previous method of machining.

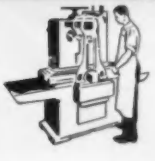
Parts range in size from 9½" to 23⅜" outside diameter and lot sizes vary from 100 to 1000 pieces.

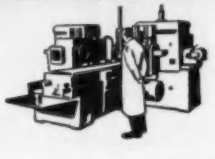
Even though the lot sizes are relatively small the quick set-up and many other features of the Sundstrand Automatic Lathes make it possible to obtain savings like these.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







WHY SUNDSTRAND CAN OFFER ECONOMICAL SOLUTIONS TO PRACTICALLY ANY TURNING JOB

Many years of designing machine features to increase production and lower costs on all classes of turning problems has provided Sundstrand with the experience to design and build equipment for practically any turning job. A few of the diversified types of Sundstrand tooling and equipment provided for different turning problems are shown on this page.

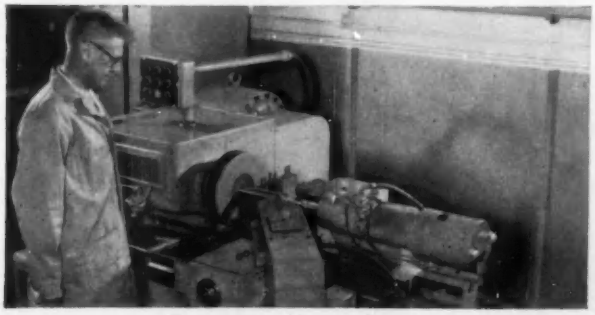
Automatic Tool Resetting

Self compensation for tool wear and automatic replacement of tools worn to a predetermined limit have been built into the Automatic Lathe shown above. Lathe can run approximately an 8 hour shift without attention, except for an occasional check by operator to make sure parts are being delivered to the loading mechanism.

Although the lathe shown above is for turning motor rotors the principle of automatic tool re-setting has been applied to Sundstrand Automatic Lathes for other types of jobs.

How to get the right machine for your work

Investigate the many services and physical equipment available from Sundstrand "Engineered Production." Call in a Sundstrand engineer, or write for bulletin 270. There is no obligation for this service.

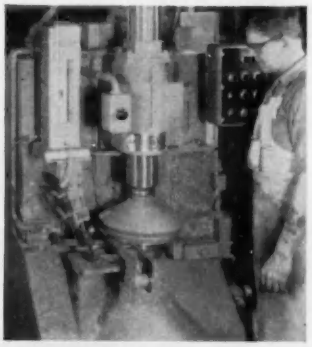


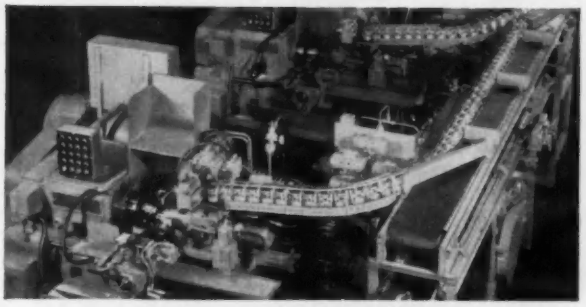
Tracer Turning

For multi-cycle single point turning of irregular shapes, Sundstrand Automatic Lathes can be provided with a template controlled tracing slide that replaces the regular front carriage. With this tracing slide and controls, ruff, semi-finish and finish cuts can be taken with one turning tool in an automatic cycle. The regular rear slide can be used to square up shoulders, chamfer, etc.

Vertical Turning

Here's the Sundstrand Vertical Lathe of a simplified basic design easily adapted to production work. Shown here, it bores, polishes and gages the ID of brake drums. Machine is easily arranged for turning, grooving, or tracer applications.

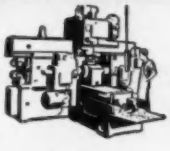


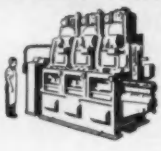


Automatic Loading

Here's one of the many automatic loading and unloading units designed for Sundstrand Automatic Lathes to handle a specific part. Units of this type simplify machine operation and provide a complete automatic cycle for high production.

TRIPLEX RIGIDMILS | SPECIAL MACHINES

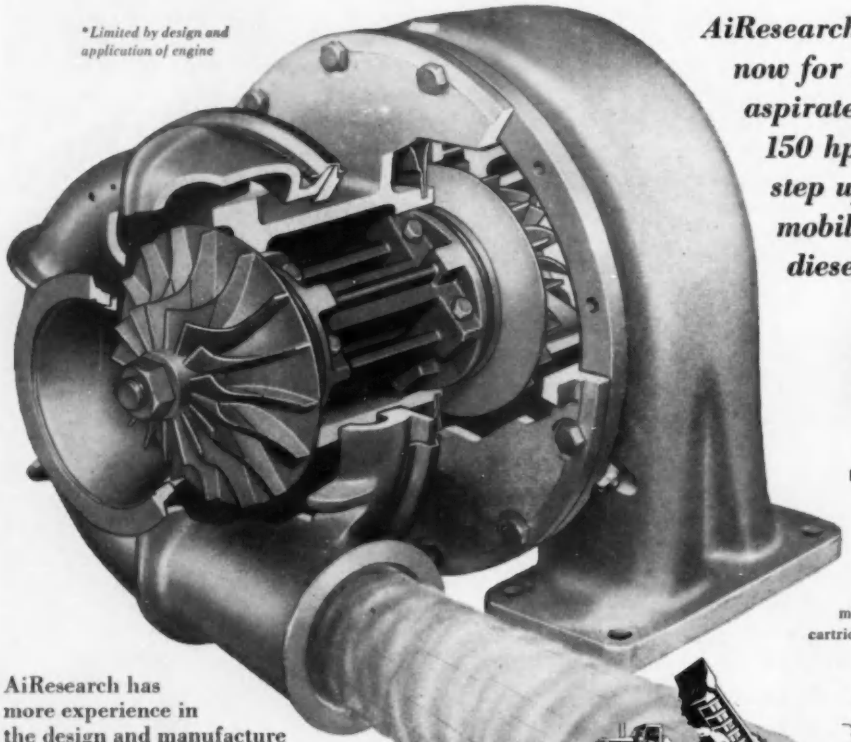




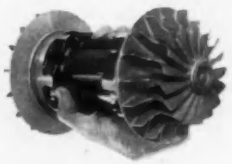
SUNDSTRAND
Machine Tool Co.
2571 Eleventh St. • Rockford, Ill., U.S.A.

AiResearch Turbochargers improve diesel engine performance up to 100%*

**Limited by design and application of engine*



AiResearch units are available now for use with normally aspirated diesel engines of 150 hp and up. They step up performance of both mobile and stationary diesels, land or marine.

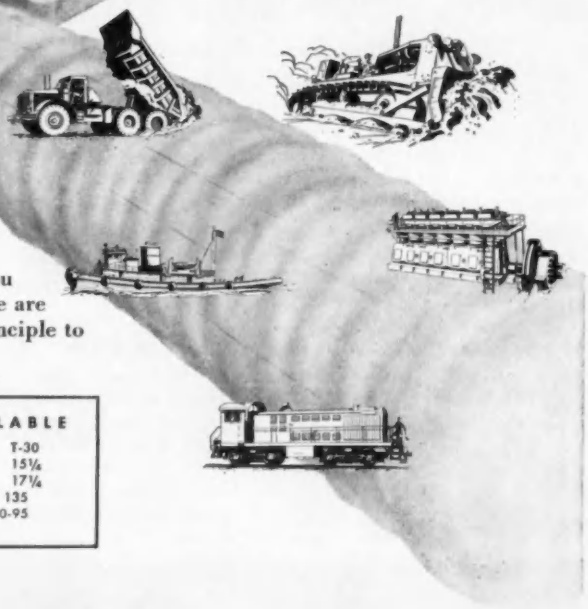


Removable cartridge simplifies repair and overhaul

This cartridge contains the turbocharger's rotating assembly, bearings and seals in a factory balanced package. It can be replaced in minutes with another factory balanced cartridge by a mechanic on the scene.

AiResearch has more experience in the design and manufacture of small turbomachinery than any other company. AiResearch turbochargers are the most efficient and safest units of their kind. New additions to the AiResearch family of turbochargers have widened their range of application in the diesel engine industry.

Our engineers welcome the opportunity to work with you in improving the performance of your diesel engines. We are happy to confer on applications of the turbocharger principle to your power plants.



AIRESEARCH TURBOCHARGERS NOW AVAILABLE

MODEL	T-10	T-15	T-16	T-30
Diameter — in. nom.	9	15¼	11½	15¼
Length — in.	9	16¾	15¾	17¼
Weight — lb.	39	125	100	135
Output — lb/min. (Standard Conditions)	25-40	35-65	45-65	70-95

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

and Benefit by –

1. EXPERIENCE— Nearly fifty years of Ferry Cap know-how in satisfying customers *the world over* with special fasteners, is available to you.

2. ENGINEERING— Capable, experienced engineers and metallurgists are ready to assist you. These men are accustomed to solving difficult problems. Why not discuss your needs with us?

3. ACCURACY— You can be sure of special fasteners conforming in every detail to your specifications as a result of the Ferry Cap inspection system which provides careful, thorough inspection at *each stage of manufacture* as well as of the finished product.

4. DELIVERY— To meet customers' delivery requirements, our raw material and production scheduling is designed for *timely mass production* of special fasteners.

Full information and quotation on top quality, competitively priced, special fasteners will go forward to you promptly upon receipt of your blueprints.

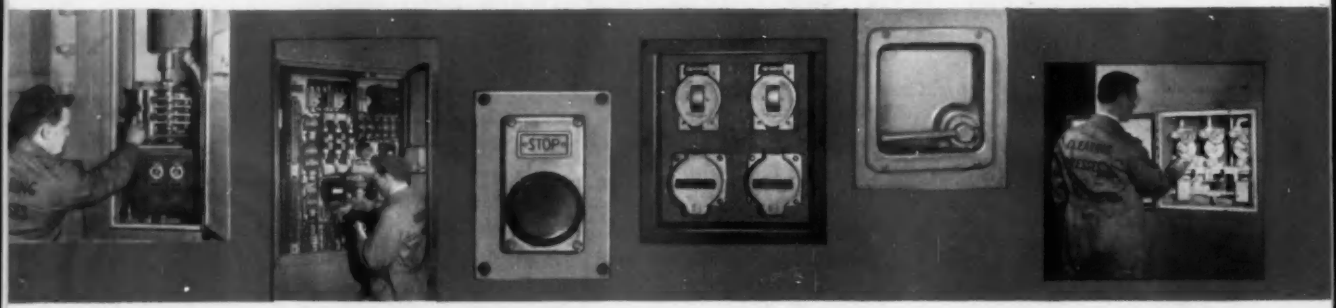
The FERRY CAP & SET SCREW CO.

Pioneers and recognized specialists , cold upset screw products since 1907

2191 Scranton Road Cleveland 13, Ohio

fully

The 650 ton double action press shown above incorporates all the advantages of Clearing enclosed design. Operator is shown using the new Clearing Flextrol—a device that lets the operator anchor his operating buttons at the exact spot for most convenient operation on each job.



Automation Limit Switch controls operation of auxiliary feeding devices.

Main control cabinet enclosed behind oil and dust tight doors in the side of the press.

Flush mounted emergency stop buttons are provided at four corners of the press.

Two 110V and two 440V receptacles are provided on the rear of the right hand upright.

Cabinet door handles are recessed for improved safety.

Fully enclosed piping and wiring speed installation, simplify maintenance.

CLEARING PRESSES

THE

CLEARING MACHINE CORPORATION

6499 W. 65th Street, Chicago 38, Illinois • Hamilton Plant, Hamilton, Ohio

enclosed construction for faster, Automatic Operation— The CLEARING ENCLOSED PRESS

Installation in your plant is a breeze when you order a Clearing enclosed press. Enclosed presses, like the double action floor mounted machine shown on the opposite page, are available in any type of Clearing press from a gap type machine to a 3,000 ton underdrive.

With Clearing enclosed presses electrical and air connections are made about as easily as plugging a lamp into a wall socket. Better use of floor space, simplified feeding and improved material handling conditions are some of the advantages of this press. Improved safety and employee morale are important, too. There are no outboard devices to catch operator's clothing or body or to be damaged by moving trucks or crane loads. Contrast this press with the usual jumble of wiring and the steamfitter's nightmare of piping common to the average press installation. Controls—even the master control cabinet, a bulky six foot box to find space for—are built right into the press uprights. And all wired neatly ready to go!

There are no lamp brackets or air connections to hang onto this press frame. Die space lighting is taken care of by two "walls of light" recessed in the uprights next to the dies. Press Air Manifold and Automation Air Manifold are pre-installed within the press frame.

Below are some of the details of Clearing enclosed press construction. Take a close look at them and if the advanced thinking in design shown here agrees with your conception of what a press ought to be, call on a Clearing sales engineer for more explicit data.

Safety blocks used when setting dies are chained to disconnect plugs which break all control circuits when pulled.

Enclosed die space lights flood die area with even, shadow-free lighting.

Terminal blocks are enclosed at the junction points of crown and uprights to simplify wiring at installation.

Self-contained slide counterbalance cylinders can frequently eliminate surge tanks.

Automation Air Manifold mounted in dust tight enclosure.

Master control panel is recessed into press upright.

WAY TO EFFICIENT MASS PRODUCTION

● *Division of U.S. INDUSTRIES, INC.*

USI

CMC CLEARING

General view of a portion of the conveying system in the Ford Motor Company assembly plant, Milpitas, California. Body preparation delivery conveyors feed cross-over conveyor in foreground. All conveyors are controlled by operator at console suspended from ceiling.

Console operator's view of one of the body preparation delivery conveyors on the Ford Motor Company assembly plant in Milpitas, California. Six different conveyor systems are controlled from this point.

Flexible Controls for Body Conveyor and Painting Systems

FLEXIBILITY and ease of maintenance have been provided to a marked degree in the body conveyor and painting systems of the San Jose, Calif., assembly plant of the Ford Div., Ford Motor Co. Several interesting concepts in application of controls are illustrated by this installation. The $40 million plant is capable of turning out 800 vehicles per shift including passenger cars and trucks.

The power-driven roll conveyors were built and installed by Anchor Steel Co., and ovens and spray booths were supplied by Newcomb-Detroit Co. Control centers were purchased, by the two contractors, from Westinghouse Electric Co. Contrary to the usual practice of Westinghouse, the firm was required to send representatives to Detroit to work directly with the other contractors and with Ford engineers.

This was the first Ford division plant in which all of the control equipment for the conveyors, ovens and spray booths was engineered completely prior to installation. In addition, the complex relaying and in-

Controller Design at Ford's San Jose, Calif., Assembly Plant Provides for Ease of Modification

terlocking equipment is installed in the motor control centers, which usually house only groups of combination motor starters. The centers themselves are grouped in blocks, instead of being scattered throughout the plant in the usual multi-purpose floor-mounted control panel. Thinking of Ford engineers was that the controller design selected allowed modifications to be made easily at the time of installation, and additions to be made over the years. Blank spaces were left in the structures; and, of course, the centers can be extended in length as required. The magnitude of the installation is well shown by these figures: there are 74 control centers, with from one to 17 structures each, for a total of 383 structures. The installation uses a total of nearly 1500 relays.

Ford specified that as many standardized circuits as possible be developed. Plug-in construction was used wherever possible. These two factors help make the task of returning malfunctioning equipment to operation as simple as possible. Also, training maintenance men is easier with single basic circuits for such operations as standard overload starter, storage conveyor control, automatic transfer conveyor, standard variable speed control, etc.

Other requirements were set forth by Ford. Sequence operations for flow of materials were to be initiated by positive acting devices such as limit switches and push buttons. Thus, time intervals could be erratic, and maintenance men would be concerned only with direct physical contact between the part being handled and the appropriate limit switch. The Reese switches follow JIC standards in being wired back to a terminal board in the control center. Operator controls were to be kept as simple as possible, such as a single push button to initiate any sequence of operations.

In designing the conveyors, Louis-Allis variable speed drives were specified. The final assembly conveyors had two drives for each conveyor. The spare unit can be placed in service simply by removing the shear pin in the drive that failed and inserting it in the alternate drive coupling. Jam relay protection is connected so as to shut down the

(Turn to page 120, please)

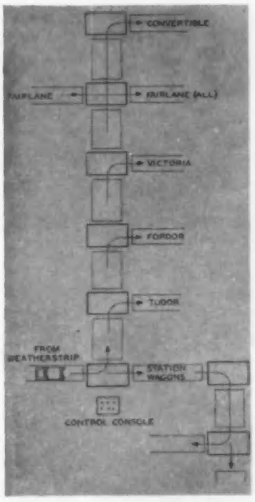


FIG. 1

Six-station transfer system

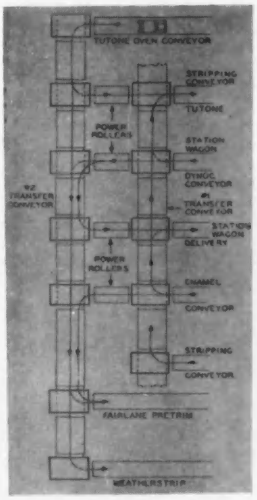
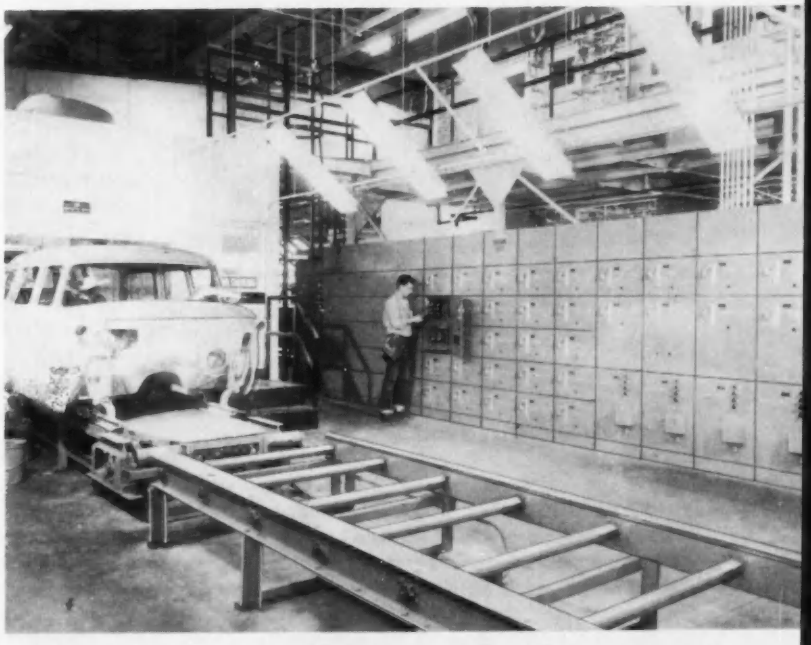


FIG. 2

Arrangement of conveyors and power rollers in one of the systems



Body emerging from paint spray booth on paint selectivity conveyor in the Ford Motor Company assembly plant, Milpitas, California. The operator in the background is making an adjustment of a motor starter that is part of this large centralized group of motor controls.

Photo of die casting machines on production line. Trolley tracks, on which each machine is anchored, are visible in the foreground.

DIE CASTING MACHINES

Anchored on Trolley Tracks

Here a machine enters the service area from trolley on tracks provided for each service stall.

THE new die casting plant of Doehler-Jarvis Division of National Lead Co. in Stowe Township, just outside of Pottstown, Pa., is now in operation and complements the other Doehler-Jarvis plant located in Pottstown which was opened in 1924.

A feature of this new plant is the arrangement of the casting machines themselves. Each machine is anchored at its working location on trolley tracks. When an order for die castings is completed and the respective casting die must be dismounted from the casting machine, all lines supplying electric power, hydraulic pressure and water are quickly disconnected, a track-guided trolley unit which runs the entire length of the building comes alongside and lines up its own tracks with those of the die casting machine. The machine is power-pulled into the trolley building and sped to the service area. Meanwhile, another machine, already preheated and with another die for a different casting, is taken to replace the machine which has been withdrawn. The machine which has been withdrawn is then serviced and another die is mounted in place and made ready for the next interchange of machines.

At the end of a production run, the time involved to dismount one die and to mount another consumes anywhere from a few hours' time to 15 to 20 hours. Therefore, this feature of the casting machine being withdrawn from its place and being replaced with another machine and casting die reduces the lapse of time of non-productive hours to a matter of 20 or 30 minutes at the new plant.

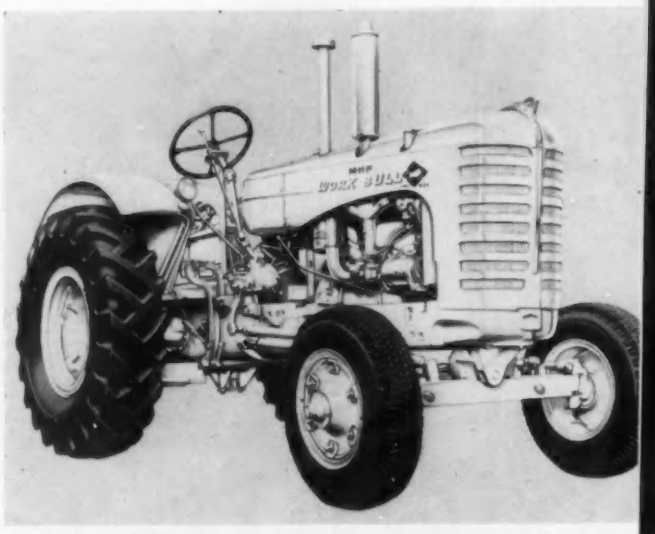
The hydraulic system used in this plant is said to be the most modern in the die casting industry. To force the molten metal into the steel dies, hydraulic pressure of 1275 psi is created by centrifugal hydraulic pumps and distributed in 10-in. pipes. A central hydraulic area has been installed.

The plant, which turns out aluminum die castings, is designed with all casting machines on a direct straight line; and trimming operations take place on a straight line behind the casting machines. After this the castings are machined — where necessary, inspected, packed and lowered to the loading platform where Doehler-Jarvis trucks take the shipments to various customers.

The entire casting, trimming, machining and inspection operations in this plant are conducted on the second floor. This system more handily permits use of the outside trolley in machine exchanges, and enhances the ventilation system.

From metal ingot to die cast pieces packed in cases and ready for shipment, all in the same day, can be accomplished in the new plant. The building itself is a modern two-floor structure covering 210,000 sq ft.

New Utility Tractors *Brought Out by* Massey-Harris-Ferguson



The Model 404 which delivers more than 50 hp for such varied operations as lifting, loading, digging, mowing and plowing snow.

THE line of light and medium-duty utility tractors announced by the new Industrial Division, Massey-Harris-Ferguson, Inc., consists of M-H-F work bull models 202, 303, 404; 202 forklift; and the Davis pit bull. Some of the models are already in production, while others will begin rolling off the lines in September, when all models will be available.

Mid-Western, maker of the Davis line of front and rear-end attachments for industrial tractors, will supply a special line of equipment for the work bulls. These will complement those which have been engineered by M-H-F. The 20 hydraulically controlled attachments offered provide a tool for a wide variety of tasks that include digging, loading, lifting, dozing, trenching, grading, materials handling and mowing.

The Model 202 is designed for such uses as digging trenches, spreading top soil, mowing and landscaping. Featuring a 134 cu-in. engine, the 202 delivers 34 hp and can mount any of 20 attachments, including front end loaders, backhoes, mowers and sweepers. The 202 is capable of road speeds up to 15 mph. Its recommended bucket loader capacities range from 9 to 11 cu ft, and backhoe buckets from 12 to 36 in., depending upon the material. The forklift attachment on the 202 has a capacity of 2000 lb. Other features include: dual-range transmission with six speeds forward and two reverse; individual rear-wheel brakes; power steering and complete hydraulic control; and 12-volt electrical system.

In addition to the specialty work performed by Model 202, Model 303 can be applied to light earth-moving and materials handling operations for a variety of contracting and industrial applications. The 303, with a 208 cu-in. engine, delivers 42 hp and has an in-line transmission with five speeds forward and reverse. Road speeds up to 15 mph are possible. A Diesel engine and power steering are offered as optional extras.

Model 404 is the largest tractor in the line. Delivering 52 hp with its 277 cu-in. engine, the 404 handles the bigger buckets, loaders and hoes. In addition to hydraulic control of both tractor and attachments, it features a five-speed transmission, gear-driven differential, worm and sector steering (power steering optional), full-pressure lubrication and a 12-volt electrical system. A Diesel engine and power take-off are available as optional equipment. The transmission provides five speeds forward and reverse.

A torque converter, power clutch and optional power steering highlight the Davis pit bull, which can be employed in medium and medium-heavy jobs. The unit is a shovel-loader that can handle a wide variety of auxiliary attachments. Its gasoline engine develops 42 hp. Reversing clutches permit direction changes without shifting.

The M-H-F Model 202 Forklift is based on a specially built unit, utilizing the basic 202 in reversed position with the load over the large drive wheels. If desired, the fork arms can be detached and replaced with either a blade or bucket to handle utility and clean-up work. The 202 engine has aluminum pistons, dynamically balanced, heat-treated crankshaft and interchangeable, steel-backed precision bearings.

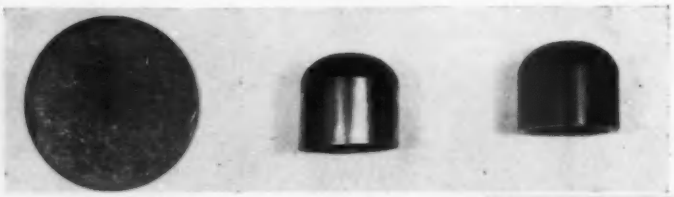
Engines for the 303, 404 and Pit Bull feature exhaust valves that rotate and replaceable wet sleeves.

• • •

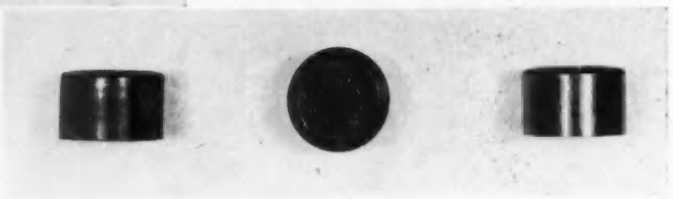
GM To Hold Conference For Science Teachers

High school science teachers who have been holding summer jobs at General Motors' plants will attend a special conference on Aug 19 to 25 at the corporation's Technical Center north of Detroit. The conference is designed to point out the importance of basic science and mathematics in high schools, particularly to students seeking careers as engineers, technicians and skilled craftsmen.

How basic mathematics, chemistry and physics are applied to automotive engineering and research will be discussed at the conference, and newest methods used to solve technical problems will be shown to the teachers. The educators, in turn, will take back the information they learn to their students with the hope of stimulating more interest in science studies.



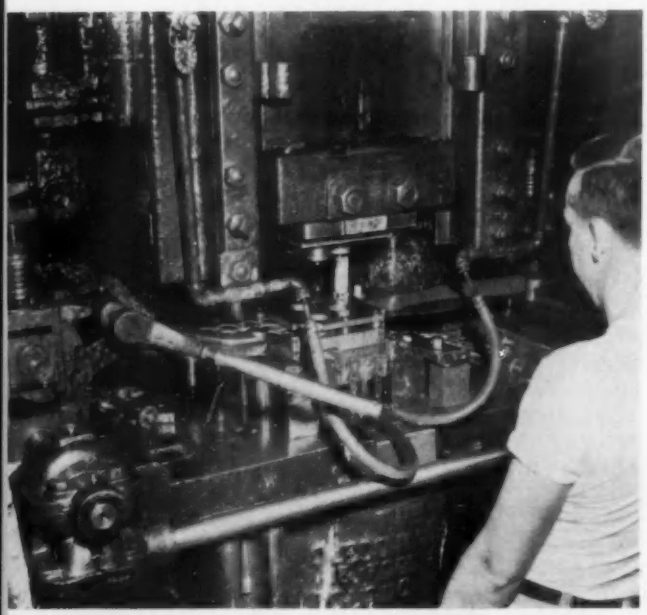
Shown here is the evolution of a Spicer bearing race, produced out of strip steel by cold forming, machining and grinding, from blank to finished product.



BEARING RACES *Drawn from* Coil Stock Steel

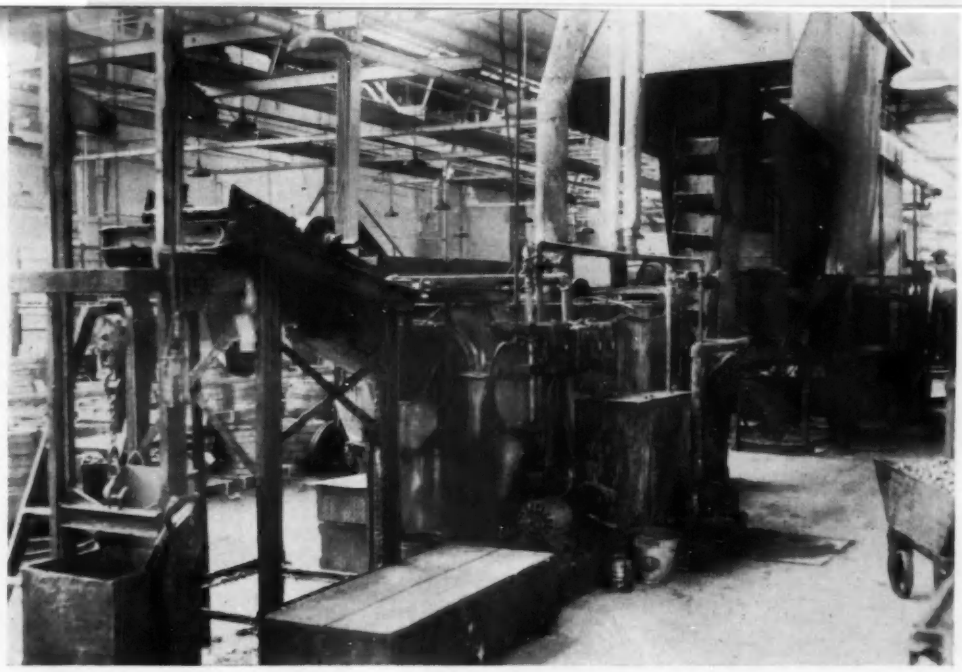
BEARING races for automotive joints are being made of strip steel by a seven-step process devised by the Pottstown, Pa., division of Dana Corp. Current production requirements for this component approximate two million units per month, or enough bearing races for the drive shafts of 250,000 vehicles.

Steel used for the process is coil stock 5.625 in. wide and 0.120 in. thick. One of the problems involved in the manufacture of this part was the fact that it is larger in diameter than at depth. Cold drawn parts have a tendency to grow in length; thereby, there were filling out problems which had to



This press is performing the blanking operation, three blanks to the stroke from coil steel 5⅝ in. wide and 0.120 in. thick.

Blanks fed into this press emerge with the first forming operation completed.

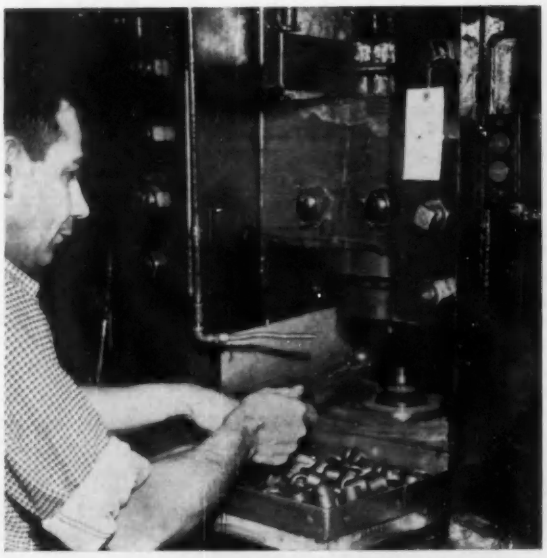


After being formed, the bearing races are washed and annealed in the equipment shown here.

be resolved in order to hold the precision toierances required. Dana holds ±0.005 in. across the inside diameter.

In the first operation for the manufacture of the bearing race, three slugs are blanked out with each stroke of the press. These blanks or slugs are then manually loaded in a chute on the first forming press. An air cylinder operating a slide is used to actuate the mechanism which loads each blank into the die cavity. The machine has an air ejection system which is utilized to remove the cupped workpiece from the die cavity.

The workpieces are next loaded into a hopper where they are elevated by means of an overhead hoist onto a belt conveyor which starts them through the washing cycle. Upon leaving the washing machine, the parts are picked up in a bucket-type conveyor and carried vertically overhead to the annealing furnace. Bearing races are cycled automatically in the furnace and dropped out of a chute into a tote bin. *(cont.)*



Final forming is accomplished at this work station.

Left—Parts are faced to length on an automatic facing lathe.

The naming operation is performed on a press as shown. The Spicer identification is applied after final forming.

Bearing races are ground to conform with outside diameter specifications on a Cincinnati centerless grinder.

A Davenport automatic facing lathe is used to machine the parts to proper length. The lathe is equipped with a manually operated central lubrication system for all grease fittings. Work coming out of the lathe is again deposited in a tote box for transmittal to the final forming press. Here the cup shape workpiece is flattened out to form the desired characteristics of the bearing race. This press is manually fed and unloaded. Tongs are used for the loading and unloading cycle. Parts are then passed on to a press for the naming operation—Spicer trademarked.

The final operation is performed on a Cincinnati centerless grinder. Here the outside diameter of the race is ground to very close tolerances.

• • •

Chrysler Organizational Plan Brings More Executive Shifts

Another significant move was made last month by Chrysler Corp. in its organizational development program with the announcement of nine new management appointments. Among the most important changes are the elevation of E. C. Row to administrative vice-president of the corporation and the promotion of William C. Newberg to Group Vice-President—Automotive to supervise all vehicle divisions and the MoPar Div. Both are newly created posts.

Mr. Row, who had been president of Chrysler Corp. of Canada since 1951 and who a few weeks ago was named president of the company's Export Div., will occupy the No. 2 spot in the corporation. He will relinquish his export and Canadian posts.

Mr. Newberg has been president of Dodge Div. since 1951 and a corporation vice-president since 1953. During World War II, he was chief engineer of the company's Chicago aircraft plant. M. C. Patterson, vice-president of Dodge in charge of manufacturing operations, will succeed Newberg as president of that division.

Another important change includes the appointment of R. S. Bright to the new post of Group Vice-President—Basic Manufacturing. In his new capacity, he will supervise all engine, transmission, and other parts plants under the Automotive Component Manufacturing group.

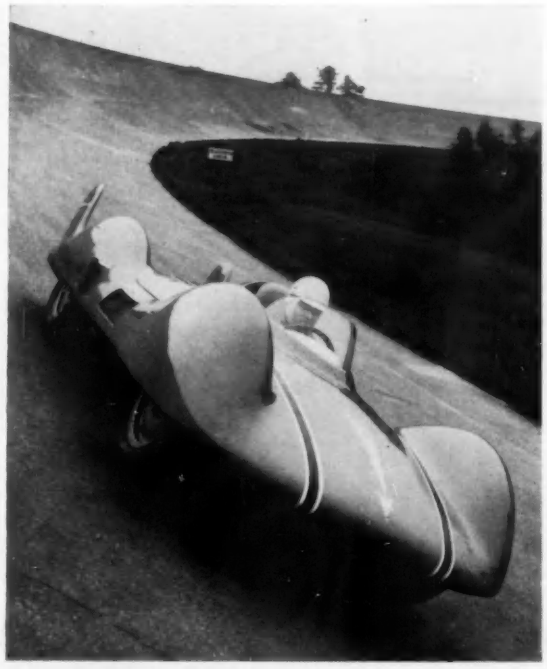
Other appointments include: Charles L. Jacobson, vice-president for dealer relations, who will retain his present job as vice-president in charge of sales; Nicholas Kelley, Jr., president of the export Div. to succeed Row; Ron W. Todgham, president of Chrysler Corp. of Canada, Ltd.; Charles B. Gorey, Jr., director of the manufacturing staff; and Emlyn Lloyd, director of purchasing.

Novel Device Duplicates Operation Of Car Engine

An interesting new device is being developed by Buick to test the strain and stress that an automobile engine undergoes during actual operations on the highway and in city traffic. It consists of a box with a tape record which duplicates exact engine operations from a car being driven on the road to an engine on the test rack in the laboratory.

In tests, the recording tape is installed in an automobile undergoing actual driving conditions outside of the laboratory. While the car is in motion, the tape records all engine operations, including acceleration, deceleration, and idling.

The tape is later fed into the box device which is hooked up to an engine in the laboratory. The engine in the laboratory, Buick engineers explain, will operate in exactly the same manner as the one in the tested car.



Front view of Renault Shooting Star turbo experimental car on the Montlhéry track near Paris

Renault's EXPERIMENTAL Gas Turbine Powered Car

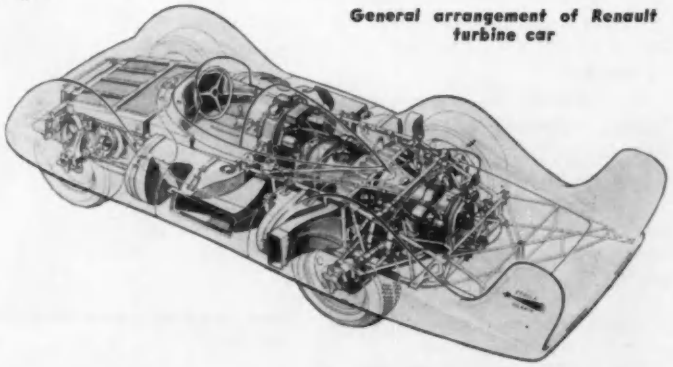
AFTER Rover, Fiat and Austin the French Régie Renault is the fourth European maker to bring out an experimental gas turbine driven car. Unlike the three other designs, the Renault Shooting Star is a single-seater Grand Prix type vehicle designed to be driven at speeds up to 200 mph.

The power unit consists of a Turbomécа type Turmo 1 flight turbine without a regeneration cycle. With its centrifugal compressor turning at 35,000 rpm and a secondary turbine speed of 28,000 rpm, 270 hp are delivered at the drive shaft. Three stage reduction gearing gives an overall ratio of 11.2 to 1. The engine is mounted behind the driver who sits well forward in the chassis.

Welded chrome-molybdene steel tubes are used for the frame. Front suspension is by twin trailing links, which carry ball-joints on their ends and have transverse torsion bar springs. A low-pivot swing axle is used at the rear in connection with longitudinal torsion bar springs. Single telescopic shock absorbers are fitted at front and twin units are used for the rear wheels.

All four brakes are of the Dunlop disk type and carried inboard, the front brakes being connected with the wheels through splined and jointed half shafts. The glass-reinforced plastic body has an open cockpit and two large stabilizer fins. Dry weight is given as 2100 lb, and the principal dimensions are: overall length, 190 in.; wheelbase, 94 in.; tread, front and rear, 47.4 in.; and overall height to top of windshield, 39 in.

General arrangement of Renault turbine car



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Case Planning on Closing Ala. Farm Equipment Plant

J. I. Case Co is closing down another one of its farm equipment manufacturing plants. The move is seen as a further step toward confining production to fewer plants.

The latest unit scheduled to shut down as a result of the declining sales is the 195,000 sq ft factory at Anniston, Ala. Operations from that plant will be transferred to the company's facilities in Burlington and Bettendorf, Ia. Earlier, it was announced that the Burlington plant also was scheduled to shut down, but the company apparently has changed its plans for that unit.

Cadillac Gets $4 Million Contract For New Weapon

A contract totaling more than $4 million has been awarded to Cadillac's tank plant in Cleveland by the Army Ordnance District. The contract calls for further development on the M-56 self-propelled 90 mm anti-tank gun.

By
Thomas
Mac New

Use of
Die Castings in Cars
Increased by Optional Features

PASSENGER cars equipped with automatic transmissions, power steering, and power brakes are using upwards of 150 lb of zinc, aluminum, and magnesium die castings per car. Just recently—AUTOMOTIVE INDUSTRIES, April 15th—the American Die Casting Institute reported 1955 as a record year for die casting sales to the automobile manufacturers. No one anticipates another record for die castings this year, but it is significant that the number of die castings used per car is on the way up, according to the car makers.

Die castings have taken on much importance by being recognized as highly functional components vital to the performance of today's vehicles. In such places as automatic transmissions, engines, running gear, electrical systems, and bodies, the automobile makers have been using the die casting method as a means for the economical production of a variety of parts.

ALUMINUM

Die cast aluminum, because of its good physical characteristics coupled with light weight, is used basically for mechanical components. One of the most striking developments in recent years was the experimental die cast aluminum six-cylinder, in-line engine block produced by Doehler-Jarvis. Now, this same company is working on a somewhat more difficult problem—the production of a V-8 cylinder block. If this proves feasible in manufacture and test when all results are in, there is an excellent chance that some of the car makers will gradually switch over to the aluminum die cast block. Some current-production engine assemblies are being equipped with die cast

ELECTRICAL SYSTEM

Bezels, Frames, and Housings
- —parking lights
- —backup lights
- —taillights
- —interior lights
- —courtesy lights

Horn Ring

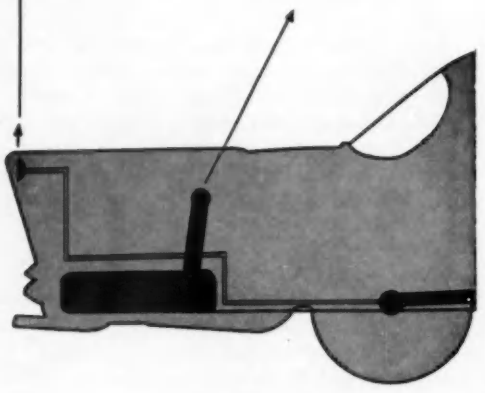
Directional Signal Components

Ignition Locks and Cylinders
Generator End Plates
Generator Cooling Fan
Starting Motor End Plates
Commutator Bearings
Distributor Housing
Vacuum Advance Housing
Dimmer Switches
Horn Bodies

FUEL SYSTEM

Carburetor Bodies and Components
- —air horn
- —float bowl
- —choke housing
- —sump plunger head

Fuel and Vacuum Pump Bodies



Instrument Panels
Radio Grilles
Steering Wheel Hub Covers
Glove Compartment Doors
Locks
Rear View Mirror Brackets
Exterior Mirror Brackets
Steering Column Shrouds
Name Plates
Window Garnish
Bezels
Cylinders

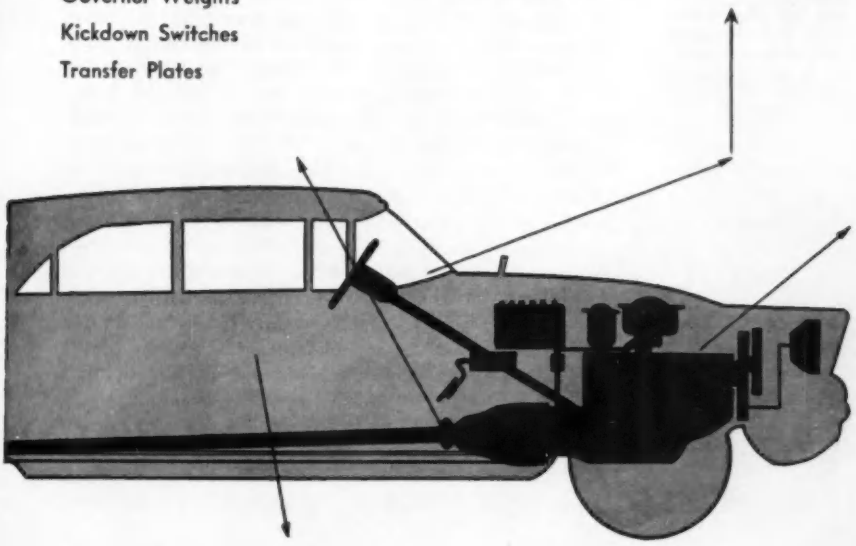
TRANSMISSION

Torque Converter Housings
Extensions
Valve Bodies
Control Housings
Clutch Pistons
Kickdown Pistons
Stators
Impeller Covers
Oil Pump Housings
Transfer Plate End Covers
Servo Bodies
Clutch Housings
Throttle Valve Levers
Piston Rod Guides
Shaft Supports
Governor Weights
Kickdown Switches
Transfer Plates
Oil Collector Sleeve
Servo Piston
Servo Sleeve

Aluminum, magnesium, and zinc die castings which are being used, or can be used, in passenger cars

ACCESSORIES

Windshield Washer Pump and Nozzles
Windshield Wiper Motors
Windshield Wiper Manifold
Windshield Wiper Linkage
Air Conditioner Parts
—evaporator mounting flanges
—air inlets
—air outlet grilles
—control panels
Heater Parts
—cases
—control panels
—valve assemblies
—defroster adapters
Hydraulic Motors
Power Seat Regulator Components



ENGINE

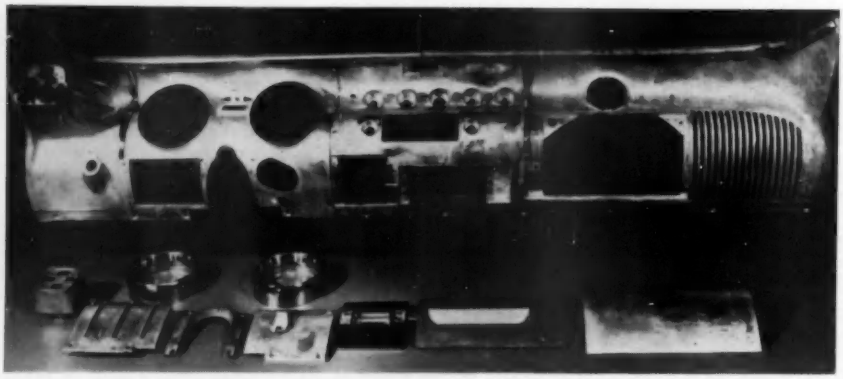
Air Cleaner Parts
Governors
Oil Filter Parts
Flywheel Housing
Cylinder Blocks
Timing Gear Covers
Pistons
Fan Spacers

BODY

Speedometer Components
Fresh Air Ventilator Linkage
Knobs
Instrument Housings
Door Handles
—interior and exterior
Control Lever Housings
Moldings
Window Control Cranks
Front End Grilles
Ornamentation
License Plate Frames
Trim—interior, exterior
Window Ventilators
—latches
—cranks
—mountings
Tail Gate Striker Plates
Window Bracket Assemblies

RUNNING GEAR

Power Steering Parts
—side covers
—valve bodies
—worm gear housings
—end covers
—housing adapters
—gear jacket adapters
—reservoir body manifold and cover
Power Brake Units
Parking Brake Knobs and Supports
Hydraulic Brake System Components
—wheel cylinders
—master cylinders
Torsion Bar Gear Housing Compensator



Instrument panel assembly made of die cast zinc alloy. Panel alone weighs 22 lb.

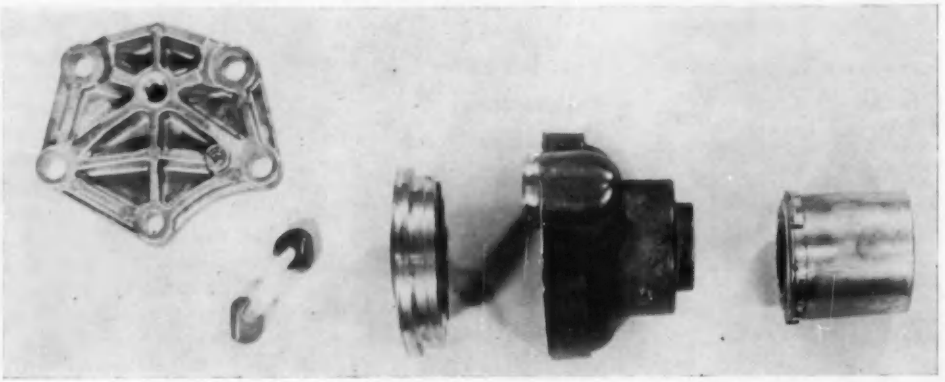
Seat actuator housing for the worm gear in power seat mechanisms is made of a zinc base die casting. It weighs 0.544 lb.

aluminum timing gear covers and bell housings in order to cut down on engine weight. Other engine parts which can be made of die cast aluminum include fan spacers, air cleaner components, and oil filter parts.

In automatic transmissions, die castings have already been well accepted, as evidenced by the large variety of aluminum components in a typical assembly. Although the total weight figure of 18.4 lb is not too impressive for the typical transmission, there are some very large and intricate aluminum die castings. Without exception, the "brains" or valve bodies of all automatic transmissions on the market today are made of die cast aluminum. The dies for a transmission valve body assembly are extremely intricate in design. One maker, for example, uses as many as 48 inserts in each section of a two-cavity die. Consisting of an upper and lower unit, these parts must be held to extremely critical dimensional tolerances. Uniform hardness for machining is required, and the parts must be suitable for proper functioning under the high pressures to which they are subjected. In one typical transmission, for example, there are six die cast components, weighing about 3½ lb, which make up the regulating system. Largest die casting in a typical transmission is usually the aluminum torque converter housing which weighs approximately 9½ to 11 lb.

Aluminum die castings also play an important part

This aluminum die casting is the gear housing compensator for torsion drive system.



Power steering parts made of aluminum die castings except for the return guide caps. The parts are (left to right) side cover, return guide caps, steering housing adapter, end cover, and gear shift jacket adapter.

in the running gear of the modern automobile. Such items as power steering and power brakes opened up an entirely new market for the die cast light metal. For power steering alone, there are some six components in a typical system. Again, like the automatic transmissions, there is the "brain" or valve body of the unit plus the side cover, worm housing, end covers, gear jacket adapter, and various other housing adapters. Hydraulic brake system components such as master cylinder and wheel cylinder parts are aluminum die castings. The torsion bar suspension system used on Packard cars uses a compensator gear housing of die cast aluminum.

The two major mechanical components in the fuel system use die cast aluminum components. Fuel and vacuum pump bodies as well as some carburetor parts are manufactured by this technique.

In the electrical system there are a few important uses of aluminum die castings. Commutator end plates for both the starting motor and the generator are being made by this method. Another part going into some makes of cars is the directional signal housing.

MAGNESIUM

Currently, there are relatively few components being die cast of magnesium. Some car makers are using the material for steering column shrouds and steering column bracket and cap assemblies. This is one of the largest single uses of the metal. Five die castings are used to make up a window bracket assembly which weighs a total of 3.5 lb. Other parts made of the material include oil seals, fuel pump housings, power steering reservoir covers, signal switch mounting plates, and fan spacers. According to Dow Chemical, the magnesium parts have reduced manufacturing costs as well as the weight of the finished component. The growth of magnesium die casting consumption by the automobile industry has to some extent been due to the development of the hot chamber process for magnesium.

ZINC

Without question, there is more zinc used for die castings in the automobile industry than in all other industries combined. Last year, 59.6 per cent of all the zinc die cast by members of the American Die Casting Institute went for automotive components.

The lion's share of the zinc goes for passenger car body brightwork. Buick, Chrysler, Continental, Imperial, Hudson, Nash, Clipper, Rambler, Packard, and Studebaker all use die cast zinc alloy grilles. Chevrolet makes use of a combination die cast zinc alloy and stainless steel grille. Another big factor for increased use this year is the trend toward die cast instrument panels in many car models. In the new designs, the panels must have complicated recesses, cutouts, and projections to accommodate the various clusters, clocks, etc. Control panels, knobs, toggles, radio grilles glove compartment doors, window latches and

WGT OF DIE CASTINGS IN CARS
With Automatic Transmissions

	Zinc	Aluminum	Magnesium	Total
American Motors				
Rambler	?	?	None	59.0
Nash	?	?	None	77.0
Hudson	?	?	None	77.0
Chrysler Corp.				
Plymouth	31.0	54.0	3.0	88.0
Dodge	40.7	54.3	3.0	98.0
De Soto	51.9	58.1	3.0	113.0
Chrysler	55.7	57.3	3.0	116.0
Imperial	88.3	58.7	3.0	150.0
Ford Motor Co.				
Ford	27.4	28.1	None	55.5
Mercury	....	....	....	....
Lincoln	....	....	....	....
Continental	78.0	58.0	None	136.0
General Motors Corp.				
Chevrolet	34.6	2.3	0.4	37.3
Pontiac	....	....	....	....
Oldsmobile	....	....	....	....
Buick	82.6	18.0	0.4	101.0
Cadillac	....	....	....	....
Studebaker-Packard Corp.				
Studebaker	51.6	12.6	None	64.2
Clipper	41.0	11.0	None	52.0
Packard	48.0	11.0	None	59.0

cranks, and a host of other items for car bodies are made of die cast zinc. A complete list of the various components is given in the illustration of the die castings in the composite car.

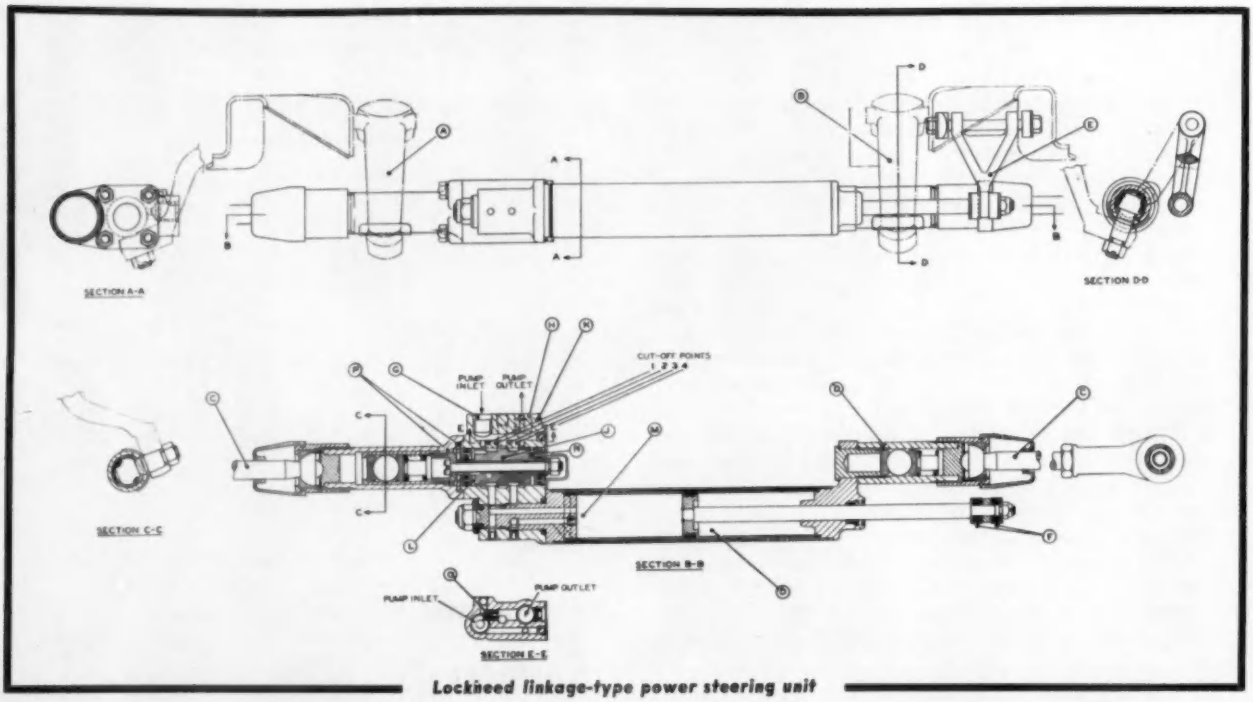
Air conditioners and heaters are another market outlet for zinc components. Such parts as air inlets and outlets, evaporator mounting flanges, cases, valves, and adapters are being die cast.

A seat actuator worm gear housing made of zinc has been designed for power seats. Also in the accessory line, windshield washer assemblies and wiper motors and components are made of the material.

In the electrical system of the car, there are numerous bezels and frames for parking lights, backup lights, headlights, and taillights. Ignition locks and cylinders are made of die cast zinc, as well as directional signal parts and the horn ring. Distributor vacuum advance units are another good example of die cast zinc.

Possibilities in the engine include air cleaner parts, oil filter parts and governor components. One company is in production with an air pre-cleaner made of a zinc die casting.

In the fuel system the carburetor body and the fuel and vacuum pump body on most cars are made of zinc alloy.



Lockheed linkage-type power steering unit

Design and Operation of the

Lockheed Power Steering Unit

THE Lockheed power steering unit, now being produced in Britain by Automotive Products Ltd., Leamington Spa, is available as a linkage assembly designed for installation in any modern chassis with a minimum of alteration to the existing linkage layout. The main body takes the place of the center rod, with the control end mounted on the steering drop arm (A), and the other end on the idler arm (B). Outer rods (C) are fastened into the housing (D). Thrust from the hydraulic jack is taken by the piston rod, which is anchored at (F) to link (E) fixed to the chassis frame.

The hardened-steel spool (J) has four cut-off points on the cast iron valve body. The annulus between cut-off points 1 and 2 is connected to reaction area (L) and the cylinder space (M) above the piston. Similarly, the annulus between ports 3 and 4 connects to reaction area (N) and space (O) below the piston. Valve stops are provided at (P).

Inlet port (G) is connected to the valve annuli via points 1 and 4, while the outlet port (H) connects to 2 and 3. There is a recuperation valve (Q) between these inlet and outlet ports.

Twin-tube construction is used for the cylinder barrel to provide an oil passage to space (O), and for added strength to withstand the bending moment imposed by the offset load. The inner steel tube forms the main bore, and the piston with two rings is carried on a chrome-plated rod working through a gland comprising a pressure seal and backing ring, leather wiper, and bronze scraper ring.

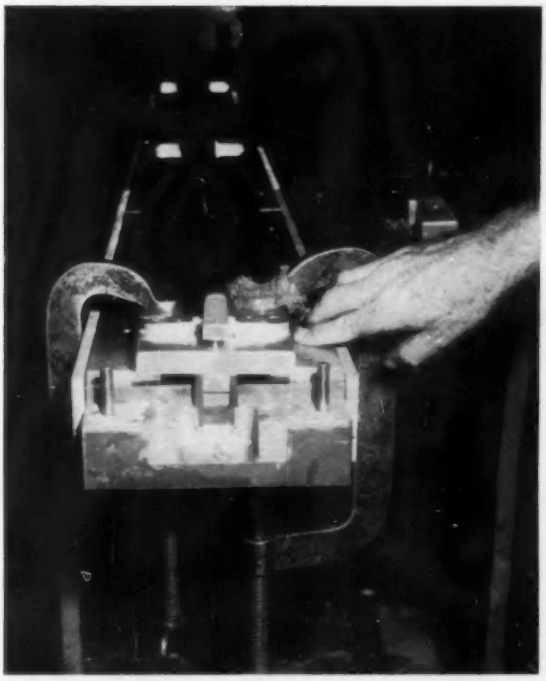
Hydraulic pressure is supplied by a seven-plunger radial pump driven by belt from the crankshaft. It is in unit with the supply tank and its relief and flow valves, and is mounted on the side of the engine block. Connections to the steering unit are made by flexible hoses.

A full quantity of fluid is pumped with the engine idling, and oil entering port (G) passes through points 1 and 2, and 3 and 4, to return to the supply tank. When the steering drop arm is moved to the left, points 2 and 4 block the oil passage and pressure builds up in cylinder space (M) and reaction area (L). Resultant pressure against the piston gives steering assist to the left, while the pressure at (L) gives the driver a sense of feel at the wheel.

During this piston movement, fluid from space (O) returns to the tank via point 3, and pressure on reaction area (N) is zero. In the same way, when the steering drop arm moves to the right, points 1 and 3 come into operation and pressure builds up on

(*Turn to page* 123, *please*)

High Precision Method *for* Shaping Sheet Metal



Cutaway view of the die used in the compression forming process. A U-shaped, pre-formed part is seen in the die. As the result of a two-way squeeze, exerted simultaneously by the plunger part of the tool on the inner cavity of the part, as well as on the tops of the part's two upright arms, or sides, the part acquires the exact shape of the die.

At Lockheed Aircraft Corp. a high-precision method of shaping sheet metal parts to close tolerances has been developed. The method is called compression forming. With it, Lockheed is turning out sheet metal parts with tolerances as low as 0.010 in. Compression-formed parts do not require hand checking or straightening after coming out of the die. The sharper flange bend radius possible with the new method lets rivets be seated almost in line with the web of wing stiffeners.

Compression forming represents a new use of the standard rubber hydropress. Initially, a sheet metal part is formed to broad tolerances by a rubber hydropress at approximately 1000 psi pressure.

Upon being taken from the press, joggles are defined and any waves in the flanges are removed by hand. The part is then shaper-sawed to establish a uniform flange width.

This part, now pre-formed, is heat treated at 925 F for 30 minutes and quenched in cold water.

While in a malleable condition, the part is inserted in the compression die for sizing.

First, a plunger built into the die transmits pressure at 1000 psi down through a rubber pad to the main body of the pre-formed part. This pressure causes the metal to spread out and fit itself to the over-all contours of the die. A fraction of a second later, a second compressing action is exerted on the outer edges of the part. As a result of this two-way squeeze, the part now is contoured to the precise shape of the die.

When the forming force is removed, the part elastically recovers a predictable amount, thereby producing the desired part to specifications.

After final forming, the part is artificially aged to 72,000 psi by heat treating it at 250 F for 24 hr.

A key factor in the application of the new technique to sheet metal parts is the reduction and control of springback.

The compression forming method is claimed to squeeze every grain of the metal to the point where all fibers are neutralized and the metal enters its plastic range. This means it loses its rubbery quality and becomes moldable.

Based on experimental tests conducted at Lockheed, it is now known that sheet metal's natural tendency to recover elastically can be accurately controlled and predicted through the use of compression forming.

Making allowance for this predictable springback and for expansion of the metal, a die of epoxy plastic is purposely made undersize. Under compression forming, the part is said to take on the precise shape that is desired and to stay that way.

• • •

1.5 Million Sq Ft Plant Planned By Ford In Ohio

A 1.5 million sq ft car and truck assembly plant will be built by Ford Div. near Lorain, O. The new unit marks a continued effort by Ford to construct larger plants with more built-in flexibility for assembling the increasing number of car body styles and optional equipment being offered.

The new plant will be surpassed in size only by the 1.9 million sq ft Mahwah, N. J., assembly plant, one of three assembly plants completed by Ford last year. Basic operations of the new plant will parallel those of the San Jose, Calif., and Louisville, Ky., assembly plants.

To be located on a 250-acre site 30 miles west of Cleveland, the new plant will contain separate manufacturing systems for cars and trucks, and will have a capacity to turn out 960 vehicles a day on a two-shift basis. The plant is scheduled for completion in 1958. It will employ approximately 2500 persons on a single shift.

New Techniques For

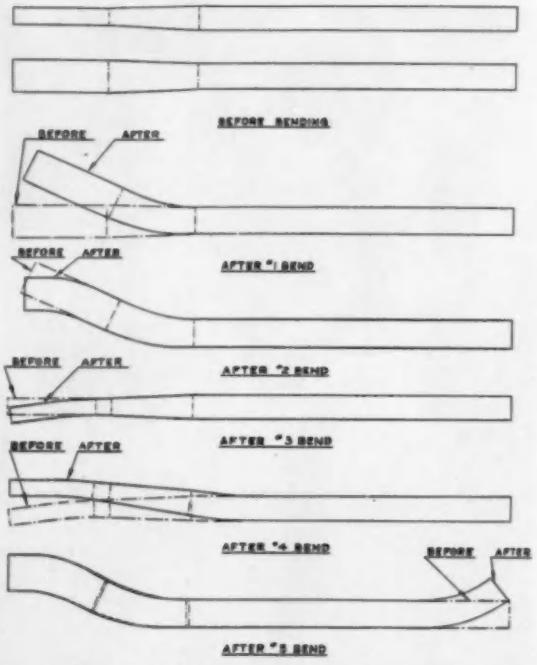


Fig. 1—Sequence of five bending operations on Chevrolet frame side rail

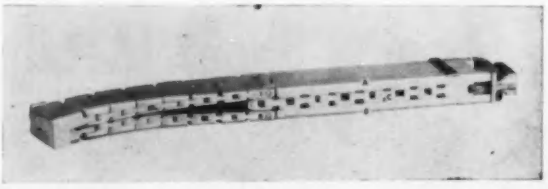


Fig. 2—Articulated mandrel used for No. 1 bend in collapsed position

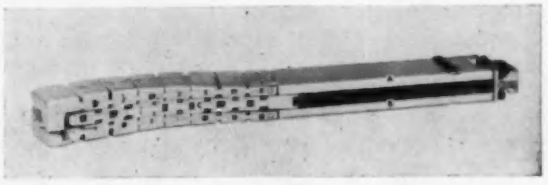


Fig. 2A—Articulated mandrel for No. 1 bend in operating position

THE most difficult frame side rail manufacturing operation anticipated from the standpoint of design, construction and experimental processing was the cold bending operation to be performed on the front and rear sections. The most difficult bends to perform were in the transposed area of the front section's forward end. (Manufacture of the 1956 Chevrolet frame was described in the Feb. 15, 1956, issue of AUTOMOTIVE INDUSTRIES.)

Bending operations are comparatively easy in a true section, that is, a section having the same width and depth throughout its length. This was the case in regard to the rear section which was of constant width and depth and required two bends. The front section, however, required a total of five bends—four in the transposed area and one at the section's rear end.

The front section's bending operations were all the more complex because no separation existed between bends in the transposed area. What actually existed was a bend on a bend, the condition where the tangent of one bend overlaps the tangent of another bend. This indicated great difficulty, as what would be done to produce one bend would affect the next bend due to stretch and movement of the metal and the close proximity of one bend to another.

It was realized that to successfully perform the bending operations, the inside area of the rail would have to be completely filled, or as close as possible with the bending tool. It was decided to use articulated mandrels as the tooling for the bending operations.

The outside diameter of the cylindrical tube, as formed in the tube mill, for both the rear and front sections is held to close limits. The inside diameter, on the other hand, is a variable dimension due to the commercial tolerances of purchased coil-steel material. In view of this, the articulated mandrels were designed to be used with the minimum inside area and at the same time be able to perform efficiently with the maximum inside area and to achieve bending with a minimum of wrinkling on the outside surface.

Each bend on the front section's forward end required a specially designed articulated mandrel. In no case was it possible to use the same mandrel design for two different bends.

Fig. 1—The side rail's front section requires five bending operations performed in the sequence shown. This was not the case, however, with the rear section's two bends where it was possible to use the same mandrel design. Special machinery was built with clamping dies and other suitable tooling necessary to accommodate both front and rear rail sections and also the mandrels necessary for bending operations. Each bend is performed by an individual machine.

In the front section bending operation, the clamping dies of the bending machine are first moved to the open position. A front section side rail is inserted into the dies which are then closed to hold the rail rigid while the articulated mandrel necessary to perform the No. 1 bend is inserted into the open end of the rail. Because of the changed insides dimensions of the front section after reform, it was necessary to design an internal articulated expanding mandrel.

Fig. 2—Shows the articulated mandrel used for the No. 1 bend in collapsed position. This internal mandrel is composed of three major sections, two outer mandrel sections shown as (A) and (B), with a primary articulated mandrel section (C) which is used as a wedge. This mandrel is inserted in the collapsed position into the tube, after entry to the desired position, the center mandrel (C) is then positioned to expand the

Automobile Frame Manufacture

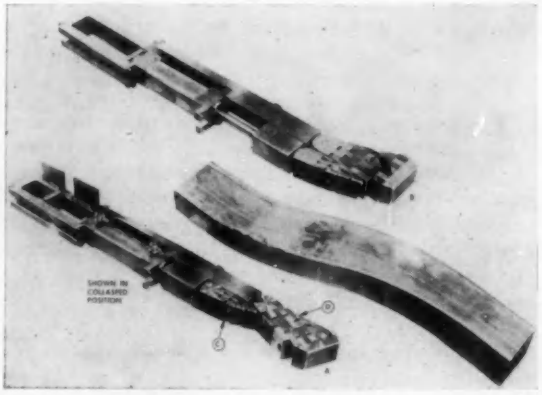


Fig. 3—Articulating mandrel for side rail front section

By Godfrey Burrows
Chevrolet-Flint Frame and Stamping Div.
GENERAL MOTORS CORP.

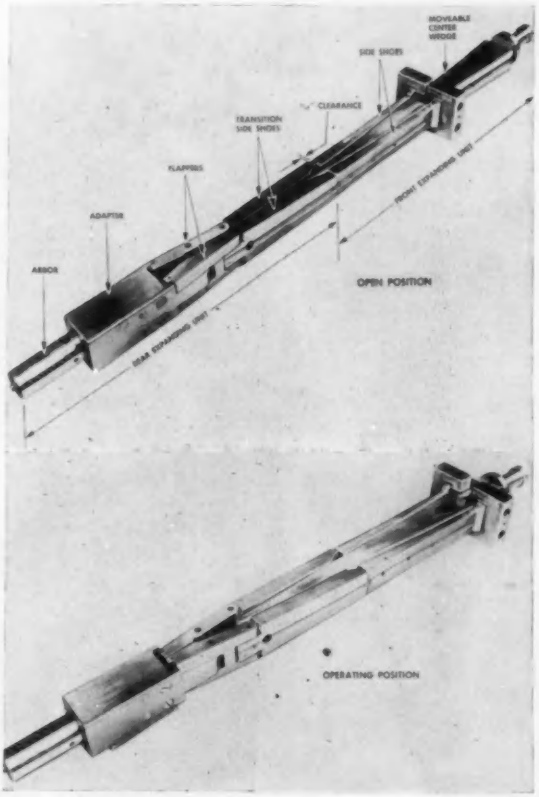


Fig. 4 — (upper) Front and rear expanding units in open position. (Lower) Tooling in operating position.

mandrel to fit the inside form of the tube.

When these operations are completed the clamping dies, mandrel and rail are moved radially as a unit until the No. 1 bending operation is completed. The clamping dies are then opened, the mandrel withdrawn, and the rail moved to the next bending machine where the No. 2 bend is performed.

The mandrel used for the No. 3 bend is referred to as a "piggy back" mandrel. Fig. 3—The No. 3 bend on the side rails front section is made using an articulated mandrel. The articulated portions of this mandrel compose two sections (c and d). In order to insert this mandrel in the tube, it is necessary to insert it in the collapsed position as shown by (A). After insertion to the correct position, secondary actuation positions section (C) on Section (D) filling the inside dimensions of the tube. The working position of this mandrel is shown by (B).

Prior to insertion of the mandrels, the inside walls of the rail are sprayed with a drawing compound.

The 101 in. long side rail front section, which has been cut to this length in a separate operation, has a width and depth of 4.00 in. by 4.50 in. The design specifications called for the forward end of the front section to have a width and depth of 2.88 in. by 5.62 in. for a length of 15¼ in. This rectangular section then must taper for a length of 14 3/16 in. back to the 4.00 in. by 4.50 in. section.

Because the periphery of the 4.00 in. by 4.50 in. rectangular tube to be used as the front side rail section was identical with the design specification requirement dimension of 2.88 in. by 5.62 in. at the forward end, the problem resolved itself into a transposition of form.

A considerable amount of experimental processing was required. A final design was achieved which was capable of performing the transposition operation efficiently and accurately and embodied the minimum of expensive tooling. The tooling design which was utilized for the transposition operation was based on two separate expanding tools—a front expanding unit, comprised principally of a movable center wedge and two

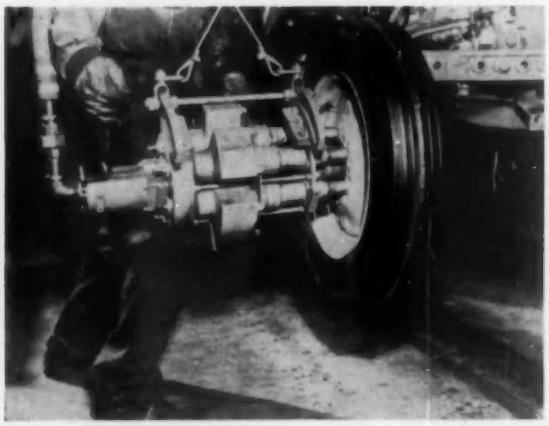
(*Turn to page* 65, *please*)

Multi-Spindle Air-Powered Tools

Used Extensively in Modern Automation

Photos and Data Courtesy Compressed Air and Gas Institute

Air powered nutsetters assemble exhaust manifolds to cylinder heads. Cap screws are run down to such uniform tightness that checking with a torque wrench is eliminated.



Wheel nuts can easily be driven from a horizontal mounting with this machine without hand starter.

AIR powered, multi-spindle production tools, first introduced through the automotive industries have made possible the installation and expansion of automation in many industrial plants.

Manufacturers have installed multiple tools to do a diversity of jobs, such as drilling, tapping, honing, and driving bolts, nuts and screws. Such tools offer speed, accuracy and control, essential to any automation setup.

One recent installation is a multiple nutsetter running two nuts simultaneously, each to a different torque and with each nut on a different level. The upper nut is assigned a tolerance range from 45 to 55 lb ft of torque and the lower nut a tolerance of 65 to 90 lb. This job was formerly done with a single spindle impact wrench. Each nut was run down and then hand set to the correct torque in a time consuming operation. Since applying the nutsetter to the work, successive inspections have shown that torque is held accurately within tolerances. Constant control results because torque adjustment is built into each individual nut setter spindle.

Another application which pays dividends in the automobile industry is where air powered nutsetters are used to assemble exhaust manifolds to cylinder heads. Cap screws are run down to such uniform tightness that checking with a torque wrench has been eliminated. In an engine assembly operation, a multiple spindle air tool is used for running down nuts on the front end of a cylinder block.

However controlled and uniform a job may be in which multiple air powered tools are applied, compressed air is the essence of the entire operation. Therefore, special attention should be paid to the following considerations.

Constant regulated air pressure at the tool is the keynote to the efficient working of any nutsetter. As the air supply determines the success or failure of the unit to perform properly, it should be kept greater than actually needed to guarantee maximum performance of the tool at all times. Multi-nutsetters are operated at a lower than line pressure to assure constant pressure for each machine in the unit. Many units are provided with individual orifice type air regulators which are built into the machine. The air regulator of each individual machine is adjusted so the machine will stall at the required torque. In many cases a diaphragm type air pressure re-regulator is built into a machine instead of an orifice regulator. Both types serve the same purpose. Regulators enable proper adjustments of individual machines in the

group, provided there is sufficient air supply to the tool to hold constant air pressure at the tool when in operation, for each unit drives independently of the other.

Air supply and constant pressure for the successful operation of multi-nutsetters should be taken into consideration when operating multi-nutsetters with a group of machines simultaneously.

Approximate air supply required for operating the machines is as follows at 80 to 90 psi pressure:—

Torque	1 to	30 lb ft	—	25 cfm
Torque	30 to	50 lb ft	—	35 cfm
Torque	50 to	100 lb ft	—	70 cfm
Torque	100 to	200 lb ft	—	100 cfm

It can readily be seen that a five spindle multi-nutsetter delivering torques at 50 to 100 lb ft must have available at the machine a constant air line pressure of 80 to 90 psi while actually consuming approximately 200 cu ft of air per minute while the machines are in operation on reduced pressure of 40 to 60 lb. The air supply, pipe line and hose size must meet these requirements. It must be taken into consideration that only when machines are in operation do they consume air, and any single operation averages less than five seconds. Therefore, the air consumption of a five spindle multi-nutsetter is only approximately 15 cu ft of air per cycle of operation, or three cubic feet per bolt or nut driven. The air consumption then is no greater than the air consumption of five individual nutsetters driving the same number of nuts or bolts.

It is wise to choose machines for today's automation that have more stalling torque than required so they can be used over a longer period of time by making air regulator adjustments to increase the pressure when tolerances in the machines increase with use. This is the reason the maximum torque of machines are not listed on torque ratings of multi-nutsetters.

A laborious job is made easy when multi-spindle air tool runs down nuts on a cylinder block.

One is perfectly safe in using the torque ratings listed when choosing a machine for the job. Better still, tell the manufacturer the torque required and the spacing of bolts or nuts and they will pick out the machine necessary when making the proposal.

To assure uniformity in operation and long life of Multi-Nutsetting machines, it is best to operate the equipment on not more than 60 pounds air pressure. This will not stress the limit of the nutsetter when used over long periods of time on high production.

• • •

New Techniques For Automobile Frame Manufacture

(*Continued from page* 63)

side shoes, and an arbor-mounted rear expanding unit whose main components were two transposition side shoes, two "flappers," and an adaptor.

Fig. 4 (upper)—Shows the front and rear expanding units, their components and their relationship while in operation. The forward end of the side rail's front section is transposed from a width and depth of 4.00 in. by 4.50 in. to a width and depth of 2.88 in. by 5.62 in. by two individual expanding tools.

Fig. 4 (lower)—Shows the tooling in the expanded view or just as the operation is completed.

The two expanding tools formed the basis about which a specially designed, hydraulically operated production machine was built to achieve the transposition operation. This machine employs a shuttle-type cross feed, central work station, automatic loading and stripping of the rail from the rear expanding unit's arbor, and two fully automatic magazine-type loading stations.

The front section side rails are fed from the cut-off operation to two magazine-type loading stations positioned on the near and far side of the machine where they are stacked one on top of the other. While one rail to be transposed is ready to be pased over arbor, one of the two arbor-mounted units, another tube which has been passed over a rear expanding unit positioned on the far side of the machine, is moved to the central work station where it is clamped. The front expanding unit then enters the rail's forward end and performs the transposition. While the transposition is being performed, the rail on the near side of the machine has been passed over the rear expanding unit and is ready to be moved to the cen-

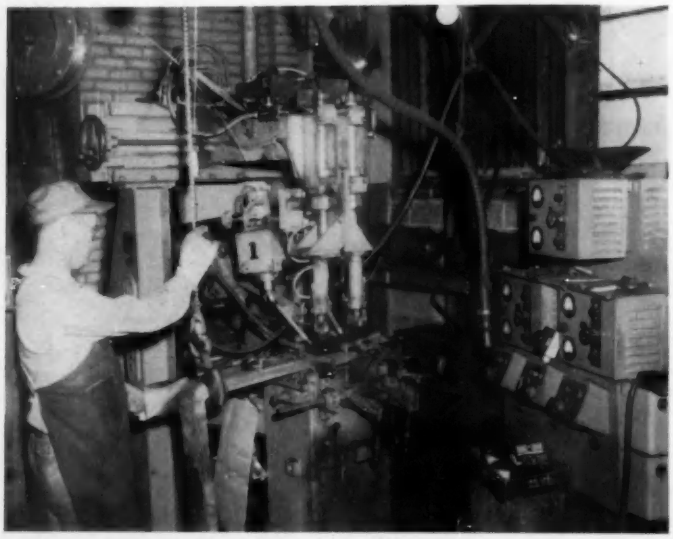
(*Turn to page* 68, *please*)

Automatic Machine Welds Lugs to Lift Truck Forks

By Arlow Gold, Master Mechanic
CLARK EQUIPMENT CO.
Buchanan, Mich., Plant

FORKS for lift trucks, produced by Clark Equipment Co., are manufactured at its Buchanan, Mich., plant. They are forged from SAE 1045 steel, and, to each fork, there is arc welded a pair of lugs that constitute the connections between the fork itself and the supporting and shifting mechanism. In service the forks must withstand severe stress and shock loading.

Welds in this relatively high-carbon steel are critical, since the joints produce high stress concentrations. Welds are made with the submerged arc process, using a special fixture by the Morton Co. One illustration shows the machine from which an operator is unloading a weldment on whose upper face the two welded lugs appear. Two of The Lincoln Electric Company's Lincolnweld automatic heads are mounted on the fixture for the welding of two lugs simultaneously.



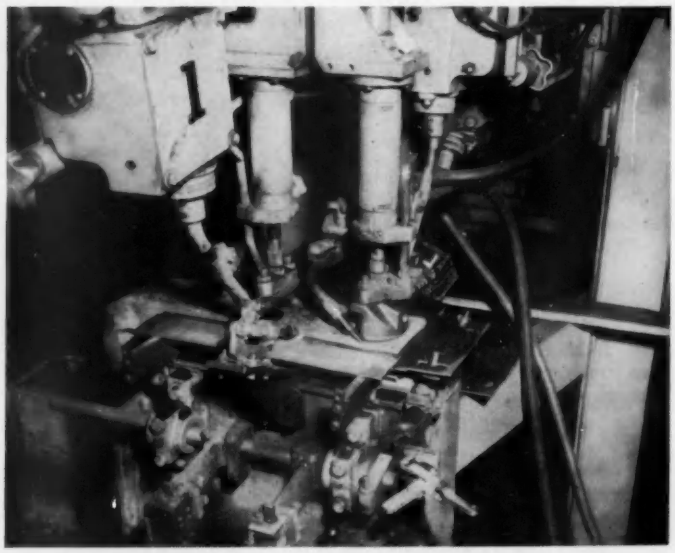
A heavy forging to which two forged lugs have been welded is unloaded from the automatic welding machine

Another illustration shows close-up portions of the two automatic heads used and the two air-clamping cylinders that hold the lugs firmly against the fork face. The setup is ready to make the weld except for the grandular flux that must be put into place from a hand-controlled nozzle before welding starts. There are, of course, locators for the fork, which rest on the bed of the machine and a gage for locating the lugs that are clamped firmly by air plungers.

The fillet welds are made along semi-circular contours of the lugs, which remain in a fixed position. For this reason, it is necessary to swing the head that feeds the electrode wire around pivots in making the welds. To do this, each of the two heads is mounted on a bracket that swings about a vertical shaft, this motion being imparted by gearing. During this operation, each electrode and arc describes about half a circle.

The close-up illustration shows the

(*Turn to page* 109, *please*)



Close-up of a fork with two lugs clamped to one face. One of the two electrode wires is shown and the setup is ready for welding, except for the granular flux that is placed along the semi-circular lug contours to submerge the arcs.

Building for Plastics Production Pressurized to Remove Dust

A MODERN plastics building, pressurized throughout to remove contaminating dust, has been occupied at the Torrance location of Douglas Aircraft's El Segundo Division.

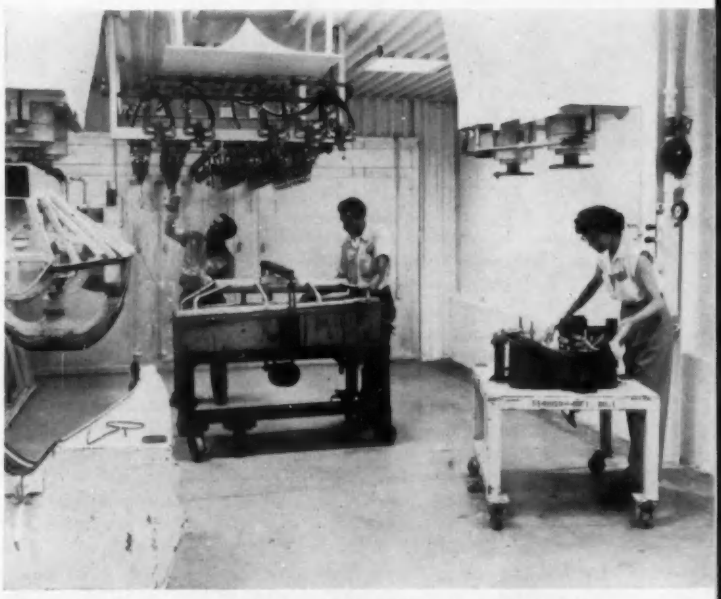
Pressurization is necessary because dust causes serious distortion in contact-formed parts in the molds. Metal dust seriously reduces radar transmission of radomes. Tiny specks of oil reduce the bond strength of plastic parts. It is essential, therefore, that entrance of outside air be held to a minimum. Vacuum-type dust collectors pick up dust created during manufacturing operations.

Over 300 production employes in the plastics department now produce approximately 4000 parts a week. An increase in this work load is expected as the department assumes responsibility for manufacture of all plastic parts of the El Segundo Division. For some time they have been building radomes for the Long Beach Division. At present, 4000 hours a week are devoted to such activities.

Constructed of new, insulated steel paneled walls, the pressurized building has 71,000 sq ft of covered floor space, including the balcony.

Along with all kinds of radomes, the department makes instrument panels, enclosures, ducts, dust covers, leading edges and fin tips.

One unusual feature is a dust free forming area where the ovens open directly into the room to prevent any possibility of contamination during the forming of enclosure materials. Even the controls are in the walls, and new-type clamping racks hold the material while it is being heated. With the ovens opening directly into the room, the heated material will not crack due to thermal shock which would occur if it were transferred from the oven to a cold room.



This pressurized room within the new pressurized plastics building prevents dust particles from contaminating enclosure material during forming operations.

All types of up-to-date equipment have been provided. There are three heated-platen presses; six ovens for curing and annealing, with another on order; punch presses; three major paint booths; two large vacuum autoclaves to reduce surface porosity of laminated parts, and a special dry paint booth to remove parts from the molds. A special section has been established in which one group does all trim and assembly work.

● ● ●

Utica Drop Forge To Become Subsidiary Of Kelsey-Hayes

Kelsey-Hayes Wheel Co. will acquire all of the outstanding stock of Utica Drop Forge & Tool Corp. of Utica, N. Y., under an agreement between the two companies. A manufacturer of compressor and turbine blades for jet aircraft and tools, Utica Drop Forge will be operated as a wholly-owned subsidiary of Kelsey-Hayes with its present management kept intact.

Fuller Adds to Plant In Kalamazoo, Mich.

Fuller Manufacturing Co. will add 112,000 sq ft of floor space to its heavy-duty transmission plant in Kalamazoo, Mich., as part of its long-range expansion program. The addition will double the capacity of transmission production over 1951, and increase total manufacturing space in Kalamazoo by more than 30 per cent. To cost about $2 million, the building is scheduled for completion early next year.

New Process Has Many Aircraft Applications

A RELATIVELY new process for increasing the heat, wear, and corrosion resistance of ferrous and nonferrous metals by high temperature diffusion of chromium into the surface is finding a growing number of applications in the aircraft industry. The process, known as Chromalizing, conserves critical alloying materials and lowers production costs.

The process produces two different types of case: the Chromalloy and the Chromacarb. On low carbon metals and alloys, the chromium forms a case whose chromium content at the outermost surface is usually close to 50 per cent and at the root is zero. This is the Chromalloy case, which increases heat and corrosion resistance.

Chromium combines with high carbon materials, such as cast iron, tool steels or plain high carbon steels, to form a chromium carbide case. This is the Chromacarb case, whose properties make it resistant to abrasion, wear and erosion. It has the same micro-hardness as any other carbide material, and its coefficient of friction is lower than that of steel.

To determine the effect of Chromallizing on the core of conventional steels, a series of tests was run on a widely used aircraft steel, Type 4130. At 1600 F, a very low temperature for this process, there was no grain coarsening or visible decarburization. At 1700 F, some grain coarsening was observed, and there was also some noticeable decarburization directly underneath the case. At this temperature range, the case depth is quite substantial—it varies from 0.0005 to 0.0015 in.—and has highly useful properties. At 2350 F, severe grain growth was induced, destroying the steel's value.

At temperatures as high as 1500 F, Chromallized steels are said to show excellent resistance to oxidation. Even up to 1830 F, Chromallized steel has a reasonable life, because the scale formed by the process adheres well. When uncoated mild steel and a Chromallized sample of the same metal were heated at 1500 F for 1000 hours, the weight of the untreated metal increased 147.7 mg/sq cm and the treated metal 0.15 mg/sq cm.

Successful Applications

Because of space limitations, only a few successful applications can be cited. Small aircraft instrument armatures made of Armco iron were treated and the results were, in some ways, superior to plating. Unlike the electroplated deposit, the Chromalloy case has virtually no effect on magnetic pull. Corrosion resistance was evaluated by a 15-day humidity test and found excellent.

Turbine housing liners fabricated from 1020 steel for the rear stage of a Westinghouse J 46 engine were treated and then operated for about 30 hours. Upon removal, the liners passed the Zyglo test without any failure and there were no evidences of oxidation, spalling, chipping, pitting, or other defects.

In a corrosion test of Chromallized panels exposed to special waterbase hydraulic fluids, the Naval Air Materiel Center set up two test conditions; the so-called vapor phase and the thin film. In the first test, panels were immersed about halfway in the hydraulic fluid at 150 F for 30 days. Test results showed a weight loss of only 0.08 mg per square decimeter per day. The appearance of the surface was "corrosion free." In the second test, the panel was fully immersed in the hydraulic fluid and held at 150 F for 30 days, with practically the same results.

Comparison Strength Tests

Chromallized tensile test specimens made of 4130 steel were heat treated after Chromallizing by oil quenching from 1575 F and tempering at 1000 F. Un-Chromallized test specimens were heat treated in the same manner for comparison purposes, with the following results: at room temperature, ultimate strength of the plain steel was 125,000 psi, of the Chromallized steel, 126,500. The yield strength was 108,000 and 112,000; elongation, 21 and 23 per cent; and reduction in area, 66 and 71 per cent, respectively. Similar results were obtained in an elevated temperature tensile test at 1000 F. The ultimate strength for the plain steel was 66,000 spi, for the Chromallized specimen, 69,500 psi. The yield strength was 62,600 and 63,-300; the elongation, 24.9 and 20.8 per cent; and the reduction in area, 69.9 and 74.4 per cent, respectively. In summary, it can be seen that the physical properties of the Chromallized specimens are at least equivalent to those of the plain steel heat treated in the same manner.

In addition to the current aircraft applications, certain other Chromallizing applications, which include nozzle diaphragm vanes and turbine buckets, are now in the early development stages. Still others—AN fittings, flame holders, ignitor tubes and cross fire tubes—are under consideration.

Automobile Frame Manufacture

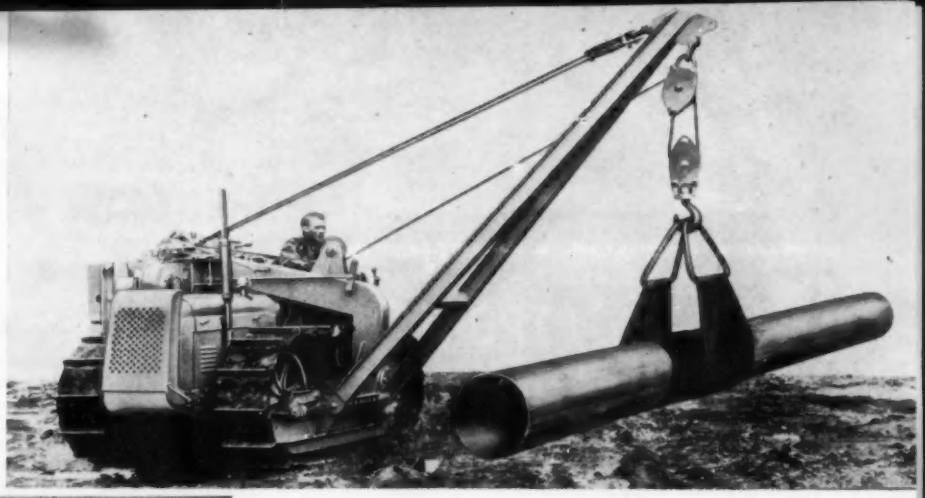
(*Continued from page* 65)

tral work station. After the front expanding unit has been withdrawn, the rail which has been transposed moves back to the far side of the machane where it is then stripped from the rear expanding unit.

Approximately 120 tons of hydraulic pressure is required to activate the movable center wedge of the front expanding unit from the open to the operating position. To remove the front expanding unit from the rail after transposition has taken place, approximtely 50 tons of pressure is required. This is only to start the unit's initial extraction. After approximately ¼ in. of movement, power is required only to carry the unit back to its starting point. To remove the rail from the arbor-mounted rear expanding unit, approximately 50 tons of pressure is required for initial extraction. After a movement of approximately ⅛ in., the power required for extraction rapidly diminishes and the rail is removed easily.

The foregoing is an abstract of an article presented by the author at the SAE Summer Meeting held in Atlantic City, N. J., last June.

The Tracklaying Fordson Major has sideboom with five-ton maximum lift capacity. Double drums for hoist and boom operate independently of the tractor gearing. Drive is taken from the side pto through separate clutches. Safety features of the winch transmission are worm wheel drive and automatic brakes. Made by County Commercial Cars Ltd.



Left—Unconventional David Brown 2D, a British tractor, has pneumatic control for implements carried between the front and rear wheels on the central frame member. This four-in. diameter tubular backbone is also used as the compressed air reservoir. The engine, mounted behind the rear axle, is a two-cylinder Diesel developing 12 hp at 1500 rpm. It is an air-cooled unit of 77 cu in. displacement with 3½ in. bore and 4 in. stroke and a compression ratio of 16 to 1. Gearbox has four forward speeds and one reverse. A pto on the front of the engine drives the compressor for the air lift system. Front and rear track widths are adjustable between 40 and 68 in. Wheelbase of the 2D is 72 in. and weight 2000 lb.

OVERSEAS TRACTORS

Above—Fork lift attachment for the British Ferguson tractor runs off the built-in hydraulic system. It has a capacity of 1120 lb and a maximum elevation of 10 ft 9 in. High ground clearance permits operation on building sites as well as on smooth surfaces. The rear-mounted equipment gives the operator a good view for both loading and driving. After loading its own trailer the fork lift arms can be folded upwards and the complete attachment with towing hook lowered to connect to the trailer drawbar.

Right—Steering and drive on all wheels gives the German BTG exceptional maneuverability and traction. The engine is mounted ahead of the front wheels, lowering the center of gravity. Optional Diesels are three-cylinder water-cooled or two-cylinder aircooled. Axles are centrally pivoted and ground clearance is high Gearbox with six forward ratios allows creeping down to 1/3 mph. Maker is Bayerische Traktoren und Fahrzeugbau, Munich, and it will be produced in Britain by Whitlock Bros., Ltd.

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS
PRODUCTION — VEHICLES — AIRCRAFT

By Samuel Cummings

ISA CONFERENCE

If advance notices are any indication, the Instrument Society of America's 11th Annual Instrumentation-Automation Conference and Exhibit promises to be lively and stimulating. The conference will be held in New York's new Coliseum from Sept. 17-21.

ISA officials say that this year's proceedings will be keyed to the slogan, "A Year's Progress Report on Advances in the Art." The technical sessions, we are told, will follow a practical line, emphasizing down-to-earth instrumentation-automation problems instead of the usual abstruse theory. In line with this shirt-sleeved approach, the conference has scheduled the following work clinics:

- A three-day Instruments Maintenance Clinic (Sept. 15-17), where for a modest fee, company technicians will be briefly initiated into the mysteries of servicing some of the latest instruments.
- A Data Handling Workshop (Sept. 17-18), where visiting engineers will get a quick exposure to the basic theory and the latest techniques of information handling.
- An Analytical Instruments Clinic (Sept. 19-20), which will present a short refresher course for chemists in the process industries in the application of instruments in the six most active fields of in-stream analysis.
- A one-day Computer Symposium (Sept. 20) on the role of the computer in controlling industrial processes, and featuring Donald P. Eckman of Case Institute of Technology as the principal speaker.

ISA officials expect a whopping attendance of about 30,000, although the society membership is a little less than 10,000. Attendance at last year's conference was almost 20,000, and considering the amount of interest displayed in industrial circles during the past year in the subject of automation, this estimate of attendance does not seem over-optimistic.

More than 300 manufacturers will exhibit their products in the Coliseum. These will include everything from instruments that continuously analyze chemical streams to remote controllers for guided missiles and compact desktop digital computers.

SAGE COMPUTER

International Business Machines Corp. recently staged a showing for the press of its giant AN/FSQ-7 computer at the company's new Kingston, N. Y., plant. The new large-scale machine is now being installed at McGuire Air Force Base in New Jersey, where it will become a vital part of the nation's vast continental air defense system which is officially known as Semi-Automatic Ground Environment (SAGE) system.

Heart of the entire SAGE project is an electronic air warning network, composed of radar-equipped land stations, Navy picket ships, offshore Texas Towers, and airborne early warning planes ranging far out at sea. This huge radar ring is linked by telephone lines or ultra-high-frequency radio to the high-speed computer.

Information about aircraft anywhere within the radar area is fed rapidly and automatically into the computer, together with ground observer reports, flight plans, and weather information. The computer gulps down this vast assortment of data and, with lightning speed, translates it on the display console scope into a general picture of the air situation, and automatically calculates the most effective use of guided missiles, anti-aircraft batteries, and jet interceptors. Directions to intercepting aircraft and guided missiles are fed by radio directly from the computer to automatic pilots in both planes and guided missiles. At any time, the air battle commander can have the computer display the overall situation, or whatever part of it he wants to monitor in detail.

The SAGE computer's most impressive feature is its high-speed magnetic core memory unit which is made up of thousands of tiny, doughnut-shaped cores. Several cores in a row store a single word or number, and their identity is determined code fashion, according to whether or not individual cores in the row are magnetized. Data may be read into or out of the memory in millionths of a second.

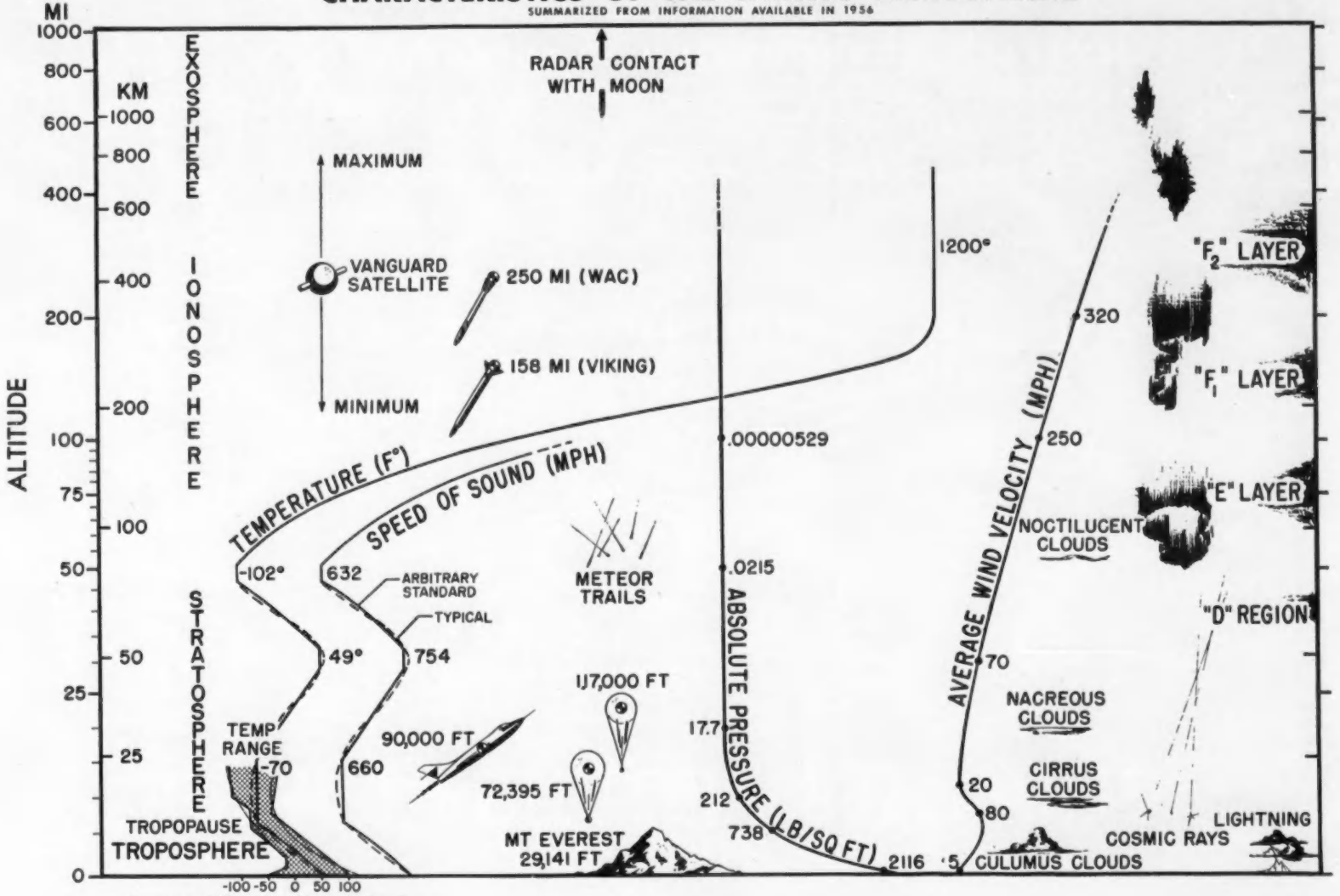
The massive computer is designed to operate 24 hours a day, 7 days a week, and it will continue to process data even during preventive maintenance. It was designed by IBM engineers working closely together with people from Massachusetts Institute of Technology Lincoln Laboratory, and it was built at the company's Kingston plant.

NEW COMPANY

Bell Aircraft Corp. has announced formation of Bell Automation Corp., a new subsidiary that will specialize in the production of automatic controls and systems. As its first product, the new company will introduce an electronically controlled system for the continuous weighing of bulk materials on a conveyor belt. The new system has already been installed in a number of plants throughout the country.

CHARACTERISTICS OF THE EARTH'S ATMOSPHERE

SUMMARIZED FROM INFORMATION AVAILABLE IN 1956



Courtesy of Douglas Aircraft Co., Inc.

By Realf W. Ottesen*
McCULLOCH MOTORS CORP.

Simplified Method of Machine Tool Cost Analysis

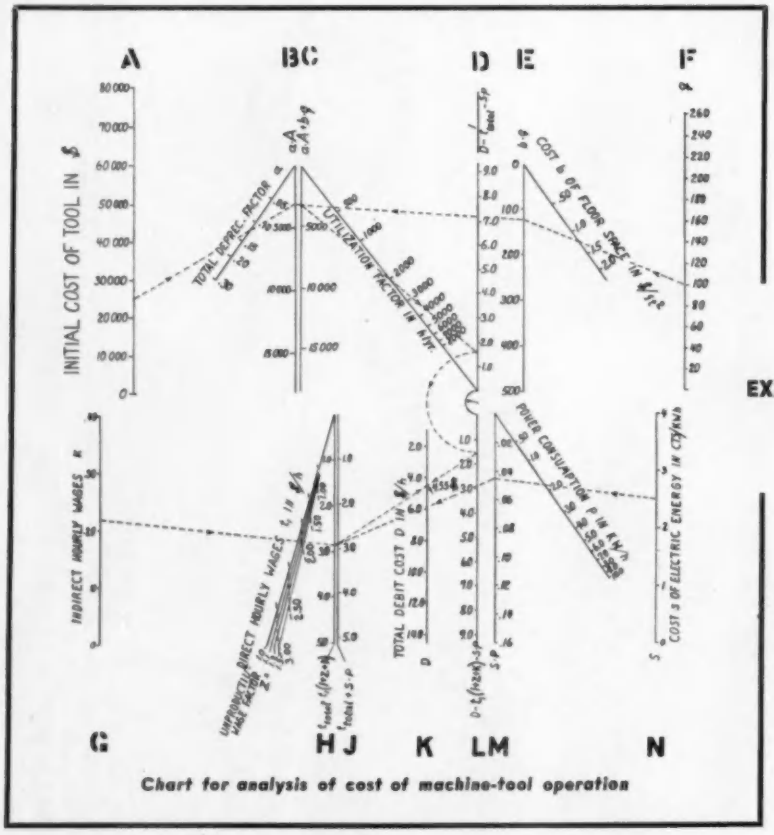


Chart for analysis of cost of machine-tool operation

EXAMPLE: PRECISION BORING MILL

A = $25,000
a = 0.1215
q = 100 sq ft
b = 1.25 $/sq ft
x = 2000 hr/yr
t1 = 2.20 $/hr
K = 0.22
z = 1.10
s = 2.5 ct/kwhr
p = 1.8 kwhr
Result: D = 4.55 $/hr

A METHOD has been derived to analyze the cost of machine tool operation under the most varying conditions. This method has been simplified in the form of a nomogram which considers 10 variables such as initial cost, space requirement, depreciation, hourly wages, and power consumption. By means of the nomogram, management not only can determine which machines should be replaced and how much their replacements should cost, but can indicate the company's status in terms of expenses, price level, trend of wages, and salaries, and the cost of an entire factory into a single, although necessarily more detailed nomogram.

There are two equations which are the basic ingredients used to make up the nomogram. These equations are shown in the next column.

$$(1)\text{—}D = \frac{aA + bq + X\,[t_1\,(1 + z + K) + sp]}{X} \text{ in \$/hr}$$

$$(2)\text{—}Y = \frac{aA + bq}{D - t_1\,(1 + z + K) - sp} \text{ in hr/yr}$$

where

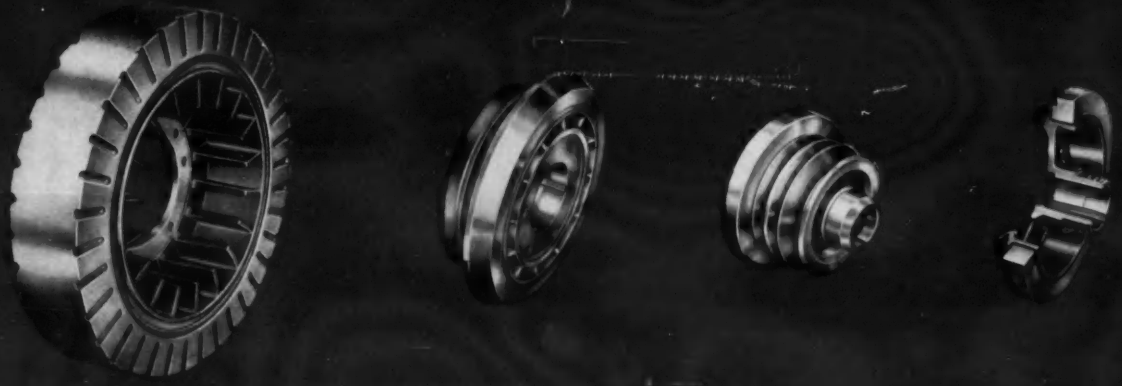
A	= initial cost	in $
a	= depreciation factor plus ⅔ of rate of interest plus rate of repair work	
q	= space requirement	in sq ft
b	= cost of floor space	in $/sq ft
X	= utilization factor	in hr/yr
D	= total debit cost	in $/hr
t_1	= direct hourly wages	in $/hr
K	= indirect hourly wage factor	
z	= unproductive wage factor	
s	= cost of energy	in cents/kwhr
p	= power consumption	in kwhr

The nomographic chart is designed in such a way that the numerator of Equation (2) remains in the upper part of the nomogram while the calculation of the denominator is performed in the lower part of it.

(*Turn to page* 106, *please*)

* *Formerly research head of the Engine Manufacturers Institute at Trondheim, Norway.*

SCHWITZER VIBRATION DAMPERS



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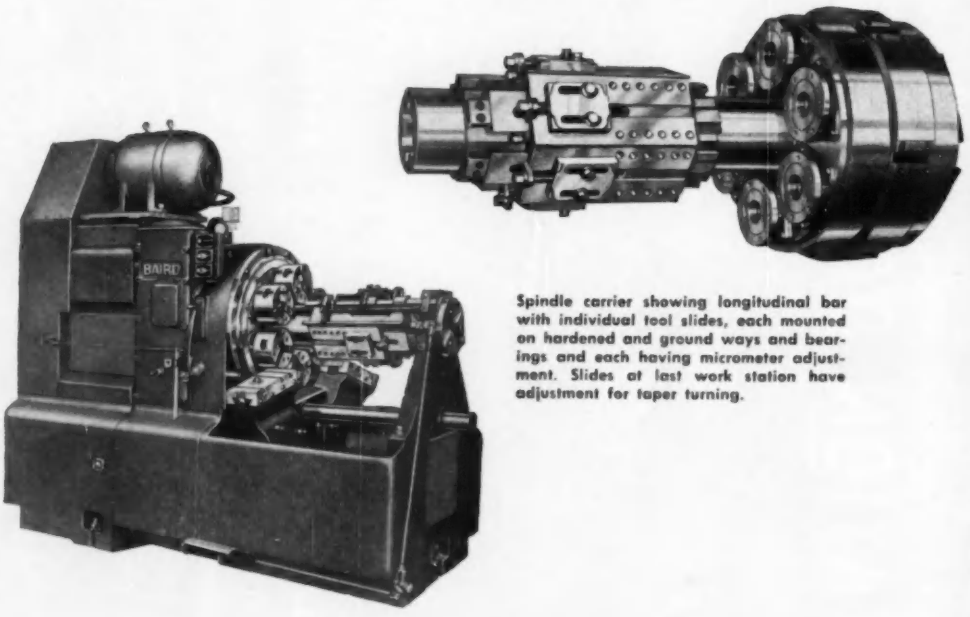
...ask BAIRD about it



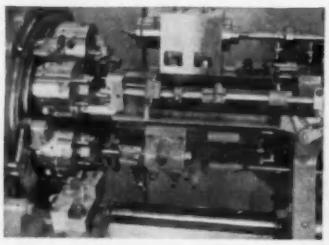
Spindle carrier showing longitudinal bar with individual tool slides, each mounted on hardened and ground ways and bearings and each having micrometer adjustment. Slides at last work station have adjustment for taper turning.

Why the preference for BAIRD Chuckers?

Aside from the fact that the Baird 76-H Chucker has enough outstanding design features and advantages to fill a 12-page brochure (which we will be glad to send you on request), there are two main reasons for its popularity.

One is the unique versatility in tooling provided by an essentially simple, "clean" design which at the same time permits exceptional scope in variety and sequence of operations and cycles . . . including complete automation.

The other is the manner in which Baird Engineering tackles an *individual* customer's problem. Here you get the benefit of our years of work with the nation's top high-production specialists . . . a staff of chucker experts, backed by exceptional tooling and test facilities. When a Baird Chucker reaches the production line, promised performance can be achieved . . . and manitained.



An example of versatile Baird 76-H Chucker tooling for finishing a die cast aluminum end plate, single-indexing, including recessing tool for back-facing . . . high speed boring heads, two-spindle lead screw tapping attachment. Production: 420 pieces per hour.

Our case history files almost certainly contain the start of a profitable answer to YOUR problem in high-speed repetitive production. Before you decide on methods or machines, it will pay you to "Ask Baird About It." Write Dept. A1.

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AUTOMOTIVE INDUSTRY
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- ☐ Presses
- ☐ Dynamometers

CALCINED PRODUCTS
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- ☐ Fans
- ☐ Feeders
- ☐ Conveyors

CHEMICALS
- ☐ Pumps
- ☐ Conveyors
- ☐ Process Machinery
- ☐ Winders

FOOD PROCESSING
- ☐ Mixers
- ☐ Dryers
- ☐ Conveyors
- ☐ Mills

GRAPHIC ARTS
- ☐ Main Presses
- ☐ Press Auxiliaries
- ☐ Winders
- ☐ Slitters

MATERIALS HANDLING
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- ☐ Cranes
- ☐ Shovels
- ☐ Lift Trucks

MINING
- ☐ Conveyors
- ☐ Hoists
- ☐ Mills

METAL WORKING
- ☐ Rolling Mills
- ☐ Presses
- ☐ Winders
- ☐ Slitters
- ☐ Loop Cars

PULP AND PAPER
- ☐ Paper Machines
- ☐ Auxiliary Helpers
- ☐ Converting Machines
- ☐ Finishing Machines
- ☐ Pulp Processing Machines

RUBBER AND PLASTICS
- ☐ Extruders
- ☐ Plasticizers
- ☐ Calenders
- ☐ Winders

TESTING
- ☐ Engines
- ☐ Pumps
- ☐ Motors
- ☐ Auxiliaries
- ☐ Wind Tunnels

TEXTILES
- ☐ Winders
- ☐ Slashers
- ☐ Dryers
- ☐ Batchers

UTILITIES
- ☐ Fans
- ☐ Boiler Feed Pumps
- ☐ Feeders

DYNAMATIC®

Eddy-Current Equipment Can Be the Solution

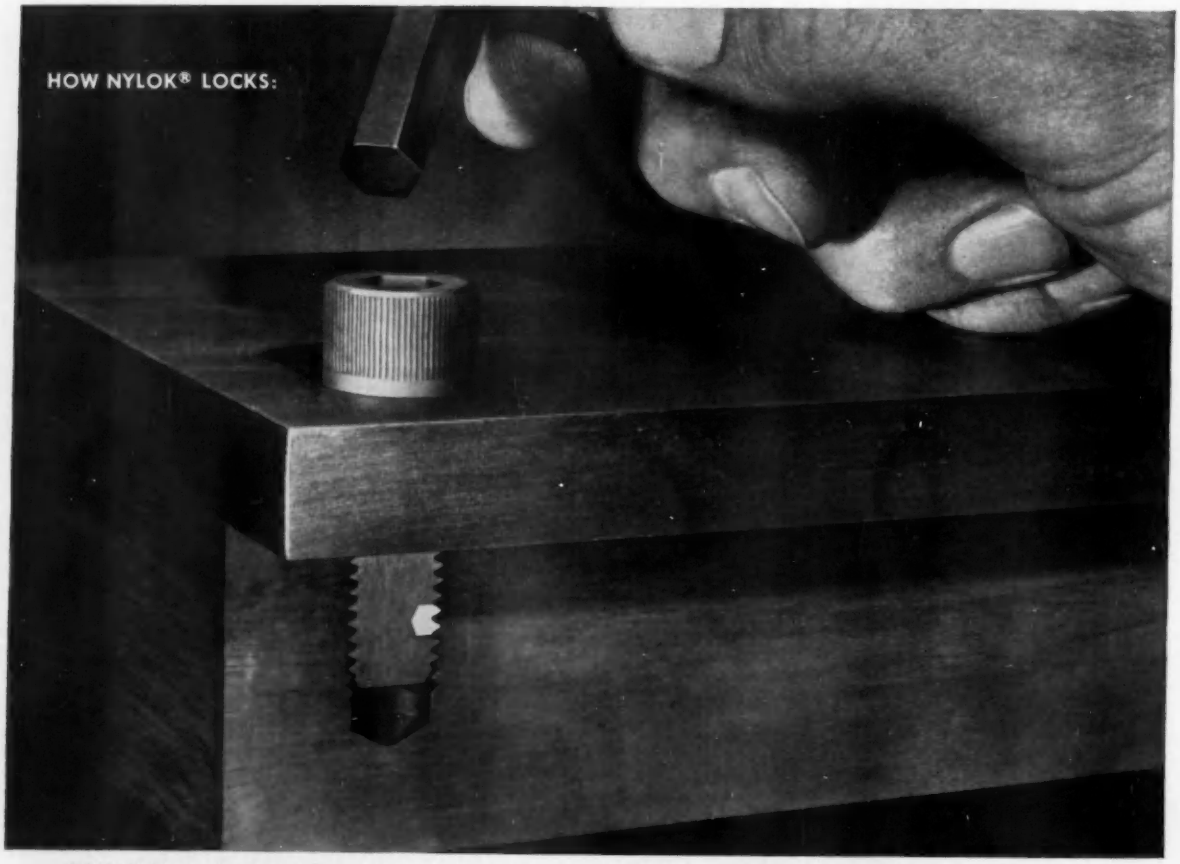
Using standard AC lines as a power source, Dynamatic torque transmitting equipment satisfies most stepless adjustable speed requirements. Dynamatic Ajusto-Spede® and Dynaspede® Drives, Couplings, Brakes, and Dynamometers with electronic or magnetic amplifier control provide the advantages of rapid response, wide speed range, quiet operation, low power losses, low maintenance cost, and remote control.

Send for your free copy of the Dynamatic Bulletin GB-2, which illustrates and describes eddy-current adjustable speed rotating equipment.

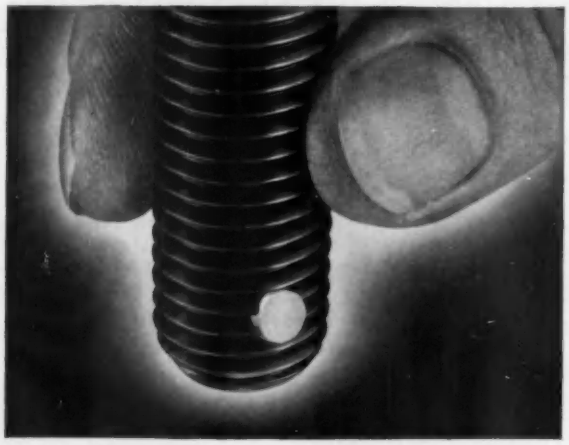
EATON

DYNAMATIC DIVISION
MANUFACTURING COMPANY
3307 FOURTEENTH AVENUE • KENOSHA, WISCONSIN

NEW—a complete line of socket screw products



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.



BEFORE ASSEMBLY. The nylon pellet projects slightly beyond male threads. When assembled, female threads will be impressed into it. Pellet locks effectively whether the screw is seated or not.

AFTER REMOVAL. "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

self-locking UNBRAKO that won't work loose

They simplify design and save production time

UNBRAKO socket screws are now available embodying the Nylok* self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

An UNBRAKO screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not shake loose.

You save production time when you build products with self-locking UNBRAKOs. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations.

Self-locking UNBRAKOs are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking UNBRAKO socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

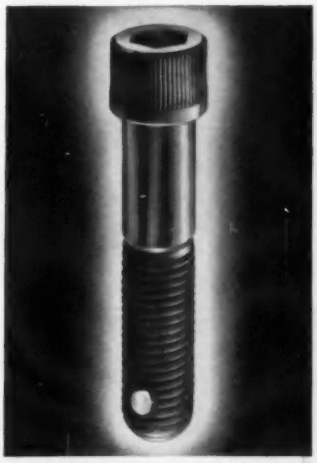
**T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

UNBRAKO SOCKET SCREW DIVISION

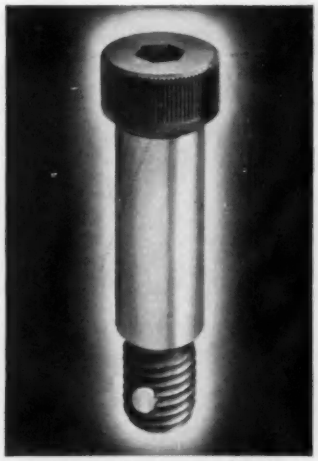
STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA



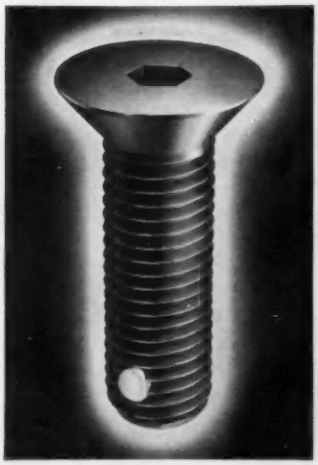
Socket head cap screws. Standard sizes # 6 to 1 in.



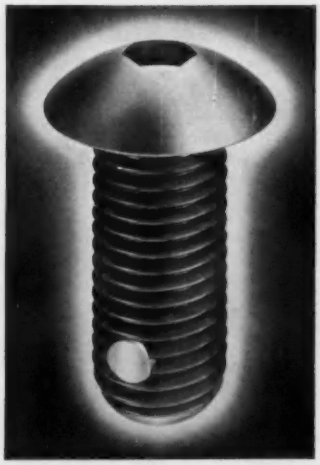
Socket shoulder screws. Standard sizes ¼ to ¾ in.

Socket pressure plugs. Standard sizes ⅛ to 1¼ in.

Socket set screws. All standard point types. Standard sizes # 6 to 1 in.



Flat head socket screws. Standard sizes # 6 to ¾ in.



Button head socket screws. Standard sizes # 6 to ⅜ in.

Wherever you look there's *Stainless*

And there will be even more stainless steel used on the cars of tomorrow. Designers know that automobile buyers are becoming increasingly conscious of the fact that stainless steel fights rust, pitting and road abrasion with much greater success than any other metal. Parts made of stainless steel stay newer longer — require far less elbow grease to maintain.

Unusual brightness of finish, plus the consistent uniformity of every inch of every coil, are two big reasons why Sharon has always been a major supplier of stainless steel to the automotive industry.

This Sharon quality and familiarity with the industry's needs can be invaluable production assets to you.

SHARON *Stainless Steel*

SHARON STEEL CORPORATION *Sharon, Pennsylvania*

DISTRICT SALES OFFICES: Chicago, Cincinnati, Cleveland, Dayton, Detroit, Grand Rapids, Indianapolis, Los Angeles, Milwaukee, New York, Philadelphia, Rochester, San Francisco, Sharon, Seattle, Montreal, Que., Toronto, Ont.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Surveys Conducted by the U.S. Department of Commerce Point to High Level of Business for the Machinery Industries During Balance of Year

Second Half Looks Good for Machinery Producers

According to a recent report from the Secretary of Commerce, Sinclair Weeks, shipments of metal cutting machine tools in the second half of 1956 are expected to be about $395 million or $18.6 million over the first half. In 1955, the second half shipments came to around $327 million. The Department estimates that in the second half of 1956 new orders will come to approximately $480 million as compared to $506 million in the first half. New orders in the last half of '55 were estimated at $557 million.

Forming and shaping machine tool shipments for the second half of this year are expected to be about the same as the first half—$130 million versus $131.3 million. The second half shipments last year came to about $104 million. New orders, on the other hand, are expected to drop off about $10 million in the second half. The first half figures totaled $148.7 million for forming and shaping tools. New orders in the last half of 1955 were about $225 million.

Shipments of resistance welding machines, accessories and electrodes in the second half of '56 should be about $40 million as compared with $43.6 million in the first half. Second half figures for '55 totaled $39.5 million. Although the second half new orders are expected to be down—$48.8 million as against $66 million—it will be over $3 million higher than the last six months of 1955.

These figures are based on industry surveys which were conducted by the U. S. Department of Commerce. Industry estimates indicate a continued high level of business during the rest of this year.

$40 Million 10 Ways

Ten major U. S. producers will share in the $40 million order that has been passed out by the General Services Administration. This order was recently approved for machine tools and other production equipment as authorized by ODM for the Marine Turbine and Gear Program. When completed, the machinery will increase capacity to make a larger proportion of marine and turbine gear sizes than are now available. The types of heavy duty tools to be procured for the program are boring bars, mills, broaches, drilling machines, gear cutting and finishing machines, grinders, lathes, milling machines, and related equipment. Companies taking part in the program are Allis-Chalmers, DeLaval, Elliott, Westinghouse, General Electric, Western Gear, Farrel-Birmingham, Bethlehem Steel, Falk, and Newport News Shipbuilding.

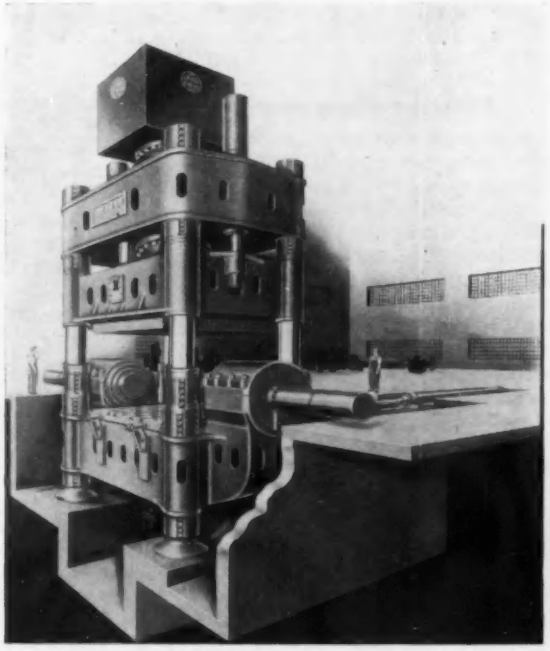
About the Government Getting Your Know-How

Along the lines of Government procurement, the Machinery and Allied Products Institute has issued a very interesting booklet dealing with a problem of acquisition by Government contract of manufacturers' proprietary technical data or know-how. The issues discussed in the pamphlet go beyond technical matters of patent and copyright law. It deals with economical procurement and the essence of free enterprise in respect to individual initiative, property rights, and research and development and the appropriate reward therefore. Anyone who would like to have a copy should write to the MAPI Washington office, 1200 Eighteenth St., N. W.

Make Defense Automatic

A short time ago W. Fay Aller, vice president and director of the research division, Sheffield Corp., suggested to a joint meeting of industry advisory committees of the Business and Defense Services Administration that plants should be de-

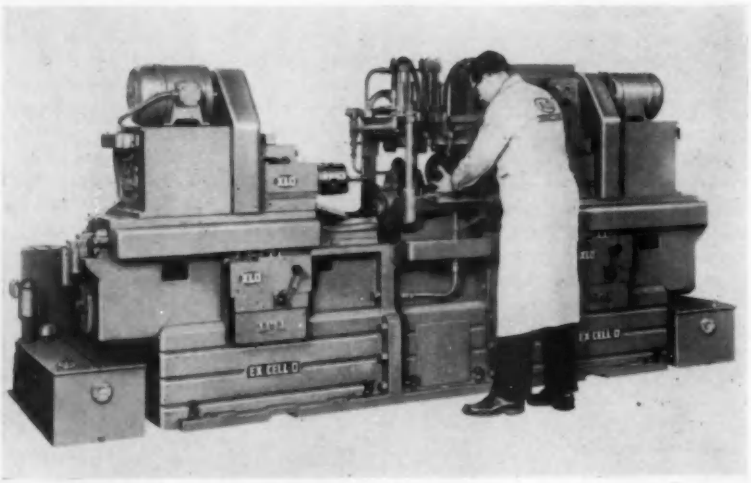
(*Turn to page* 104, *please*)



Cut-away view of the 4000-ton forging press designed by Lake Erie Engineering Corp., Buffalo. This press was recently installed at Harvey Machine Co., Torrance, Calif. Of a down stroke column type design, the press is accumulator operated with 4500 psi water pressure. The main ram and opposed side rams will be used for open forging heavy aluminum billets. The main ram closes and returns at 600 ipm and applies its 4000 tons pressure at 300 ipm. Each side ram presses with 1985 tons at 300 ipm.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Boring Machine Finishes Bearing Areas

Bearing areas inside differential cases are now being finished on this two-way precision boring machine, the operations consisting of back-boring and chamfering two diameters, holding limits of ± 0.0005-in. Two parts are clamped in the fixture and two diameters in each part are bored simultaneously during each work cycle. The boring bars enter the workpieces on the centerlines of the bores, then index out to a set diameter by means of individual cross feed heads. The spindle slides then feed back to bore and chamfer, then the boring bars return to the centerlines of the bores and are withdrawn. The basic machine consists of two standard, self-contained way units combined with a standard center section. Spindles, drive equipment and tooling are provided to suit the work. (Ex-Cell-O Corp.)

Circle 30 on postcard for more data

Plastics Dispenser

MASS production techniques in the application of cellular foamed plastics are said to be made possible with a recently developed automatic metering, mixing and dispensing unit called the Nopcometer. Designed to be used in conjunction with the Lockfoam series of foam-in-place cellular plastics, the machine can reportedly deliver to the production line, automatically and intermittently, a predetermined charge of foam of any required density, at varying rates up to 15 lb per minute. *Nopco Chemical Co.*

Circle 31 on postcard for more data

Safety Valving

To provide two-hand safety for operators of presses, brakes, shears and other machines, a new non-tie-down valve and a pair of pilot valves are now being offered.

The non-tie-down valve is interposed between two palm button three-way valves in parallel and the receiver that is to be alternately pressurized and exhausted. If the machine operator engages or disengages only one of the pair of palm button valves, the N-T-D valve will automatically cut off any subsequent air flow through itself to the receiver. Recocking of the valve for safe two-hand operation can then be accomplished only by releasing the engaged pilot valve. To permit a reasonable delay between engagement of one palm valve and the other, a tamperproof integral adjustment is provided in the N-T-D valve.

The circuit is said to be applicable to most air-operated single stroking machinery. *Ross Operating Valve Co.*

Circle 32 on postcard for more data

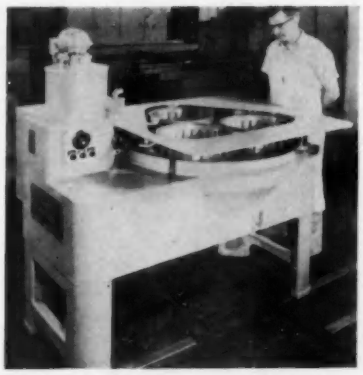
Lapping Machine

HIGHER capacity, handling of larger parts and other desirable advantages in precision production lapping operations are said to be provided in a new 36-in. model Lapmaster lapping machine. It is now available as part of a line ranging from 12 to 72 in. lap plate diameter.

Inside diameter of the conditioning rings is 14½ in., thus permitting handling parts up to that size. Capacity-wise, the machine will take over twice as many one inch parts as the 24 in. model. The roller bar attachment has been designed to provide the operator with shelf space for placing pressure plates or fixtures. The fork style agitator is placed at a 30 deg. angle in the agitator tank. This has been done to facilitate mixing of abrasive when left loaded in the tank for an overnight period, and to eliminate strain on the agitator motors.

These machines are capable of generating surface flatness to less than one light band and finishes to two rms in short or high production runs. They are used for lapping of parts such as engines, transmissions, tool and die equipment, and quartz and germanium crystals. Materials include monel, steel, stellite, brass, aluminum, glass, carbon, plastics, ceramics and others.—*Crane Packing Co.*

Circle 33 on postcard for more data

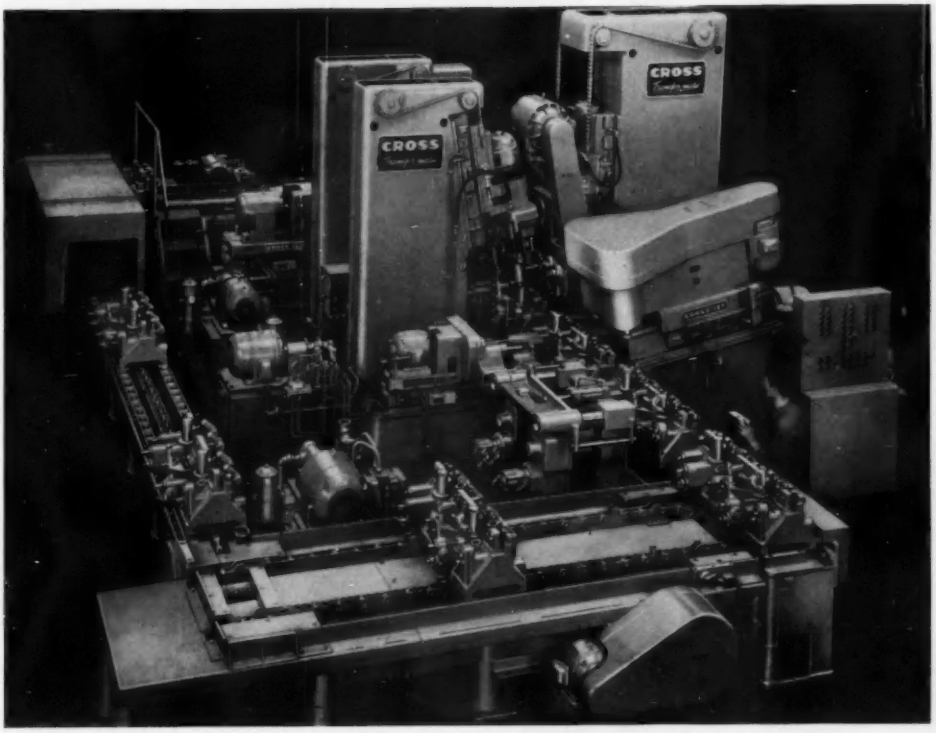


Crane 36-in. Lapmaster lapping machine

Six-Station Transfer Unit Completely Machines V-8 Exhaust Manifolds

This new Transfer-matic unit machines V-8 exhaust manifolds, using six stations to perform 51 operations—8 milling; 37 drilling, chamfering and spotfacing; and 6 tapping. By utilizing the modularization principle of constructing machine tools from standard components, versatility for part design changes is facilitated. A major feature of the machine is the reduction of down time through the incorporation of preset tooling. Palletized workholding fixtures for holding one right-hand and one left-hand manifold are provided which are automatically operated by a hydraulic power wrench. Additional features are the automatic transfer mechanism, hydraulic feed and rapid traverse for milling, drilling and boring; and individual lead screw feed for tapping. (The Cross Co.)

Circle 34 on postcard for more data

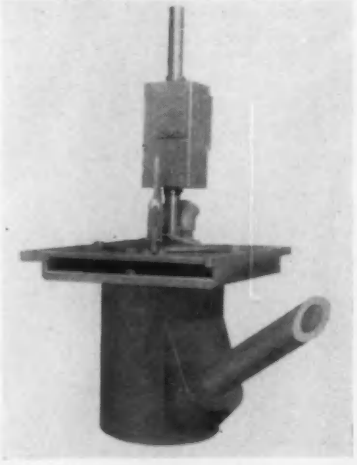


Aluminum Ladling Unit

A NEW automatic ladling unit for aluminum which makes possible fully automatic processing of many types of castings, especially aluminum die casting and permanent mold, is now being offered.

The unit is manufactured of high grade special refractory materials, and is so arranged that the molten metal being ladled cannot come in contact with any metal structure. The basic pump has no moving parts, check valves or other devices. The unit operates on the principle of a pressurized chamber, the size of the shot depending upon both the time of pressure application and the pressure. The unit is so designed that ladled metal is withdrawn from beneath the surface of the bath.

There is a wide latitude in the ladling range and it can be adjusted to vary the size of the shot. The equipment is normally supplied to cover the range of 1 to 10 lb of aluminum; other sizes of shots in aluminum or other metals are also available. Accurate control of any size shot within its range is provided with no interruption of the casting cycle during charging of metal. The unit is adaptable to electric furnaces or fuel fired reverberatory furnaces with no variation of size of shot due to metal level variation.



Lindberg-Fisher automatic ladling unit for aluminum

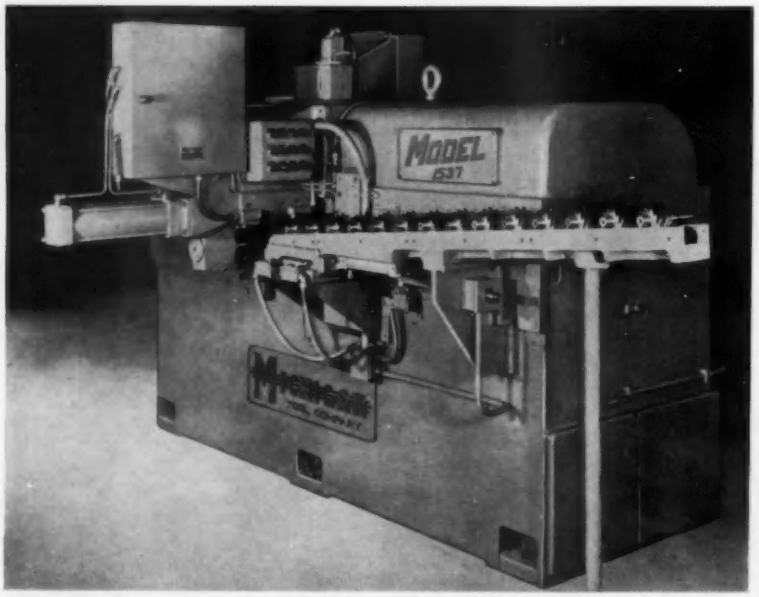
It is supplied as a complete package consisting of one ladling unit ready for immersion in molten metal, one control cubicle completely assembled and wired, and one pressure blower. All panel cubical internal equipment is front mounted and wired and front accessible to facilitate inspection. This feature allows for installation against a wall. Cubicle dimensions are 17½ in. wide by 72 in. high by 21 in. deep. Operating voltage is 220 or 440 as specified. *Lindberg Engineering Co.*

Circle 35 on postcard for more data

Strip Coating

CALLED Strip-Kote, a new type of strip coating is a plastic emulsion for protecting smooth and wrinkled metal finishes, enameled and lacquer finishes, highly machined precision parts, plastic, glass and chrome-plated surfaces from being marred or scratched during processing, shipment and storage. It can be applied by brush or spray gun. The film becomes transparent, tough and flexible after air-drying for 20 to 30 minutes. The dried film is permanently flexible, and can be easily stripped, the announcement further states. The material contains no inflammable solvents. *Chemical Consulting Service.*

Circle 36 on postcard for more data



The Model 1537 Roto-Flo spline roller can perform either one, two or three forming operations on a workpiece in a single pass. Machine can be automated as shown, or provided with manual loading.

Splines and Threads Rolled Simultaneously

DEVELOPMENT of a new model Roto-Flo machine capable of performing one, two or three operations on a workpiece in a single pass was recently announced. The Model 1537 can roll a spline, or roll a spline plus an adjacent thread, oil groove, etc., in a single pass of the forming racks. Under certain conditions, a third operation such as marking, can be added. Operations can be performed on the same or different diameters, but the forms to be rolled must be close together along the length of the shaft. Basically, the Roto-Flo process is one in which the metal periphery of a part is displaced from its undisturbed condition by cold working until it assumes a desired shape such as a spline, serration, etc. The formed parts are said to have excellent surface and tooth strength.

Parts with diameters ranging from ½ to 2 in. can be handled on the Model 1537. The rack lengths used on this model are up to 36 in., with maximum stroke length being 42 in. Part lengths that can be accommodated by either standard or universal overarms, range from 6 to 36 in. *Michigan Tool Co.*

Circle 37 on postcard for more data

Thermal Spray Gun

COATINGS of stainless steel, bronze and other metals, as well as hard-facing alloys and ceramics, can be thermal sprayed with a new gun that does not use compressed air. The thermal efficiency of the unit, called the Type P ThermoSpray Gun, is said to permit the use of high melting point materials, such as the boron-silicon self-fluxing alloys used for hard-facing and corrosion resistance, and the chrome-nickel alloys, bronze and the ceramics. The rate of application has been increased materially and deposit efficiencies are better than 95 per cent, it is reported.

The powdered materials used are held in a reservoir mounted on the gun and are fed through an abrasion-resistant connector into the gun proper, where they are picked up by the gas flow and fed to the gun nozzle. Two hoses attached to the rear of the gun carry oxygen and either acetylene or hydrogen depending upon the work and the powder being sprayed. *Metallizing Engineering Co., Inc.*

Circle 38 on postcard for more data

Ultrasonic Tire Tester

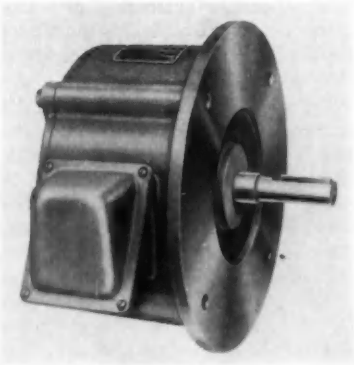
UNIFORMLY high standards of quality can be achieved with an ultrasonic tire tester which locates and measures flaws in automobile, bus, truck and aircraft tires through the use of silent, invisible, non-destructive beams, according to an announcement. Imperfections such as minute blisters and tread separations are reported on an indicator, permitting rejects of casings with flaws larger than a predetermined size. Testing is accomplished by immersing the tire in a liquid bath containing a transmitter which directs an ultrasonic beam through the tire to a receiving sound-head suspended inside the casing. *Curtiss-Wright Corp.*

Circle 39 on postcard for more data

Flat-Type Motor

SAID to provide maximum horsepower with minimum size, a new flat-type motor is available in totally-enclosed fan cooled or totally-enclosed non-ventilated types. Designed to meet the specifications for NEMA design "B" motors, it was developed for use in the machine tool and equipment industries for operating turret lathes, punch presses, milling machines, pumps, and similar applications where there is a minimum of space.

The flat-type units are of standard radial design, constructed like conventional squirrel cage motors. Easy to disassemble and reassemble, there are no precision alignments or complicated air-gap adjustments. A design feature is that the rotor weight is evenly supported between two ball bearings.



Diehl flat-type motor

Operating at 208, 220/240 or 550 v, 2 or 3 phase at 60 cycles, continuous or intermittent duty, the motors are available in ratings ranging from ⅓ to 7½ hp. They are also available for special voltages. *Diehl Manufacturing Co.*

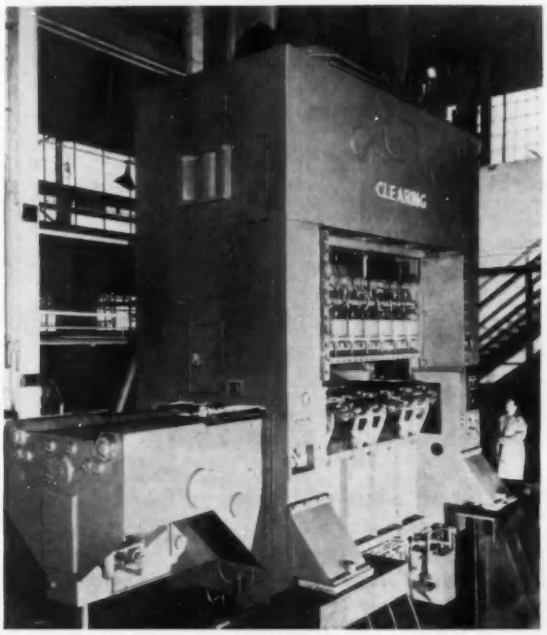
Circle 40 on postcard for more data

Presses Combine Automatic Operation with Versatility

MULTI-PURPOSE automatic presses, known as Transflex, have been developed to give the manufacturer full advantage of transfer press economy on a variety of work. They are designed for producing a number of different parts and to be easily changed over from running one part to another, the announcement states.

Flexibility is said to be obtained by making adjustable those features of the press that need to be changed when different parts are run. The automatic feed that carries the piece-part through the press has been designed so that the feed stroke may be varied. The feed may be indexed any distance required by the number and size of dies used. Adjustments are provided so that the feed fingers can be re-spaced along the feed bar to accommodate varying feed lengths. The fingers may be changed to grip parts of different dimensions. Die cushions are mounted on a track within the press bed, and can be moved laterally to obtain the desired location of blankholding pressure by means of an adjustment mechanism outside the bed. The presses are furnished with adjustable knockout positions. Air cylinders eject the part when the slide is raised. Mechanical knockout is also provided in the event a part becomes so firmly seated in the dies that the cylinder remains compressed. Both cylinders and rods are adjustable left and right. *Clearing Machine Corp.*

Circle 41 on postcard for more data



A new Clearing Transflex automatic press being tested on the company's assembly floor. The feed, shown at left, is powered by constant rotary motion taken from the drive of the press itself. The feed mechanism can be seen above and in front of the press bolster plate. The adjustable knockout cylinder can be seen on the front of the press slide.

Compression Tester

BUILT specifically for testing complete aircraft wheel assemblies, a 500,000-lb capacity compression testing machine is designed so that any one of three testing ranges—full capacity, one-fifth capacity or one-twentieth capacity — are available without stopping the test. The load is indicated electronically on a 28-in. illuminated dial. To facilitate testing, the piston and cylinder are arranged for installation in a pit so that the compression table is at floor level. The height of the motor-controlled upper crosshead is adjusted by pushing a button on the control and indicating cabinet. *Tinius Olsen Testing Machine Co.*

Circle 42 on postcard for more data

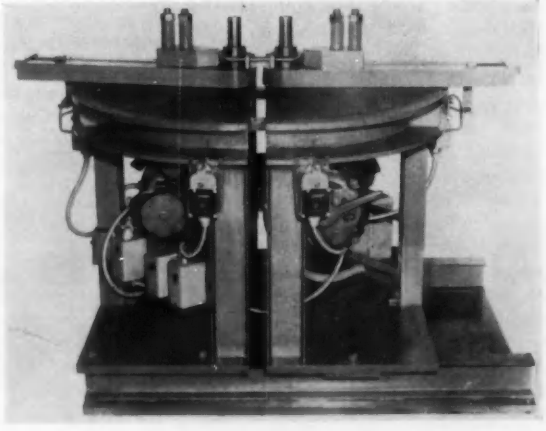
Bending Machine

COMPRISED of two units, each with a motor and relay control, mounted on a base which is adjustable as to centers and controlled from a single starting button, a new bending machine bends both ends of a pipe, tube strip or shape simultaneously.

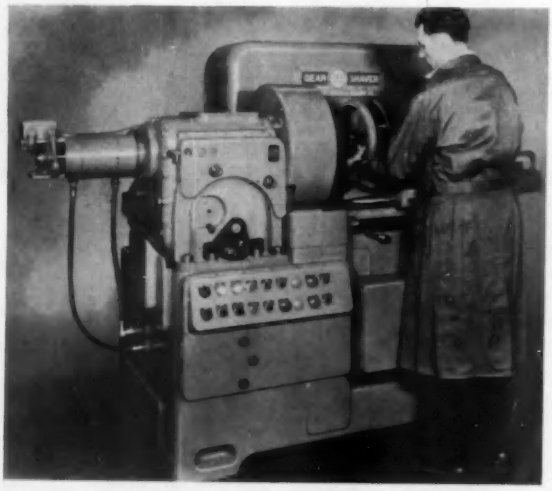
One unit normally bends clockwise and the other counter-clockwise, but both units may be set to bend either clockwise or counter-clockwise if it is desired to bend offsets. One unit may also be made to bend 90 deg and the other 45 deg or any curvature up to 180 deg. The centers are adjustable either manually or by means of a lead-screw driven by a motor, and the machine can be furnished with or without an ejector. When fully equipped, the Pedrimatic is fully automatic, taking stock from a hopper and delivering it to a conveyor in finished condition without an operator.

Its primary use is in bending two right angles in the same plane simultaneously. It can also be used to bend closed curves such as rectangles of four right angles or polygons, including hexagonal or octagonal frames made of round tube or bar stock. *Pedrick Tool and Machine Co.*

Circle 43 on postcard for more data



Pedrimatic bending machine bends both ends of a pipe, tube, strip or shape simultaneously. It is automatic in operation when fully equipped. In addition to being usable for bending two right angles in the same plane, it can bend closed curves such as rectangles of four right angles or polygons.



The improved Red Ring Model GCR internal gear shaver illustrated shaves a 75-tooth, 20-pitch, 4-in. pitch diam, 20-deg pressure angle, 18½-deg helix angle internal gear for an automotive automatic transmission. Shown is a gear being loaded on the cutter in the new semi-automatic loader.

Gear Shaver Features Semi-Automatic Loader

AN improved Red Wing Model GCR internal shaver, featuring a semi-automatic loader that speeds loading and unloading operations, is now available. The semi-automatic loader avoids former hand loading and cutter meshing procedures in shaving internal spur and helical gears from 3 to 12-in. pitch diam, having teeth up to four diametrical pitch and tooth face widths up to 2½ in.

With the new semi-automatic loader, the operator hangs the gear to be shaved on the shaving cutter, presses a cycle control button, and removes the gear from the workhead after shaving. When the gear is hung on the cutter, an approximate locator on the cutter head positions the gear in correct radial location. After the cycle start and safety start buttons are pressed simultaneously, the cutter head advances and the part pilots into the holding fixture in the workhead. The part is then automatically clamped and the shaving operation initiated. Following the shaving operation, the cutter head retracts and the part is automatically released from the workholding fixture; being ejected to a position where the operator can easily remove it.

The workhead on the improved model permits taper shaving operations to be performed on internal gears. Either conventional shaving operations with cutter reciprocation or plunge-cut shaving without cutter reciprocation, can be done on the Model GCR. Air cylinders operate the workholding fixture and the cutter head advance and retract motions. A transparent plastic insert in the cutter guard enables the operator to view the shaving operation during the cutting cycle. Change gears are provided for work spindle and cutter reciprocation drives. *National Broach & Machine Co.*

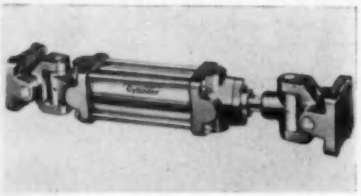
Circle 44 on postcard for more data

Cylinder Mountings

THE development of universal cylinder mountings for eliminating problems due to misalignment between air and hydraulic cylinders and their work loads, has been announced. They are available in two forms: a hinge mount cylinder with universal mounting brackets at each end as illustrated, and a cylinder with universal trunnion and universal mounting bracket for the rod end.

Applications include the operation of hopper gates, elements rotating about shafts such as gear segments and levers, and objects moving on wheels or tracks such as trucks or transfer tables. They also compensate for deflection and misalignment where cylinders are connected to structures that are riveted, bolted or welded together. *Hanna Engineering Works.*

Circle 45 on postcard for more data



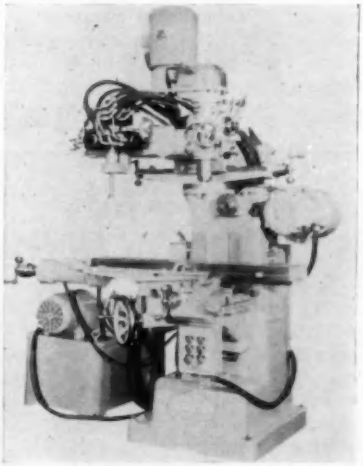
Hanna universal cylinder mountings

Three-Dimensional Mill

A NEW milling machine that will mill, jig-bore and duplicate in three dimensions is now being produced. Called the Model 10RH, it has a hydraulic duplicator attachment for making duplicate molds and dies, or for contour milling to templates. The duplicator sensing tracer head controls the movement of the table, knee and ram slide. As the operator moves the stylus over the master, the cutter duplicates his movements. Only four ounces of stylus pressure are said to be required to accurately reproduce a metal, plastic or wood master.

A feature of the machine is the reversible ram turret with all-angle spindle head at one end and slotting head at the other. The entire turret rotates 360 deg so the machine can be converted from milling to slotting in a few seconds. Any compound angle can be obtained.

Both the vertical and horizontal heads carry No. 30 NST spindle tapers which afford interchangeability of tooling. The vertical spindle has speed changes from 75 to 6400 rpm at 1½ hp torque. The horizontal spindle has a range from 55 to 3600 rpm at either 1 or 2 hp.



Axelson Model 10RH milling machine with three-dimensional hydraulic duplicator

The 42 by 9-in. table has an optional power feed. Total longitudinal table travel is 44-in. Traverse is 26-in. Clearance from spindle to table top is 22-in. Magnetic tracer valve and 14,000 rpm heads (for high-speed work) are available. *Axelson Manufacturing Co.*

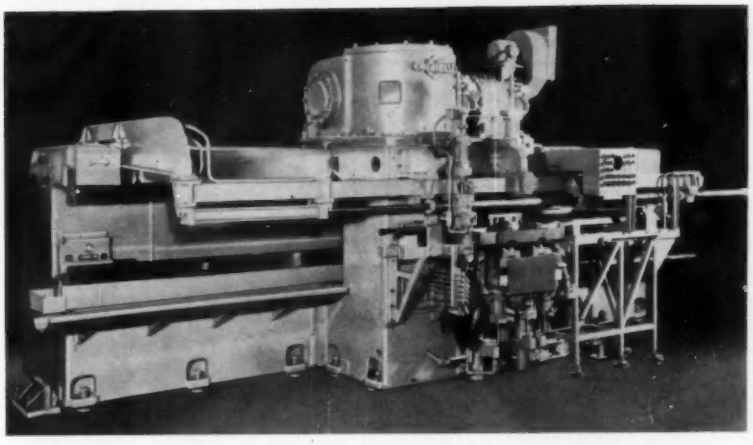
Circle 46 on postcard for more data

Horizontal Broaching Machine Features Automatic Parts Handling

INTRODUCTION of the Model 60-90 ElectroGear horizontal broaching machine, featuring the automatic transferring of parts into and out of the work station and a ram speed infinitely variable from 30 to 150 sfm, is announced. Work moves through the broaching station from right to left, in the same direction as the cutting stroke of the broach.

The entire broaching cycle is completely automatic and does not require an operator. Parts to be broached are fed by conveyor into the loading station located at the right side of the machine. From the load station the transfer bar on the machine moves the part onto the hydraulic trunnion fixture at the center of the machine. The fixture swings up, positioning the part for the broaching pass. At the completion of the broaching pass, the fixture swings down and another part is fed into position for broaching, and at the same time the completed part moves into the automatic unloading station at the left.

In a typical application, the machine broaches gasket faces on automotive cylinder heads at a rate exceeding 200 parts per hour. The surfaces on these heads are held within 0.002-in. variation. Either carbide or high speed steel broaches can be used on the machine.



Colonial Model 60-90 ElectroGear horizontal broaching machine can broach more than 200 parts per hour without requiring operator attention during any part of the cycle.

Power for the ram is supplied by a d-c motor served by a motor generator set. The driving motor is coupled to a gear box containing a double enveloping worm gear set driving a precision helical pinion. The pinion drives a rack mounted directly to the ram. It is said that both the gearset and pinion combine to give the machines exceptionally smooth drives resulting in excellent surface finish on broached parts. All hydraulic and electrical controls are interlocked and installed in accordance with JIC standards. A jog control panel is provided for machine setup and tryout runs. *Colonial Broach & Machine Co.*

Circle 47 on postcard for more data

Acid-Proof Mortar

ESPECIALLY designed for the installation and maintenance of stack linings and acid tanks, a new type of corrosion-proof mortar called Corlok is said to withstand strong oxidizing acids, nitric, chromic and concentrated sulfuric, and to be resistant to sulfation and highly concentrated acids at temperatures up to 1900 F. The announcement also states the product is non-corrosive to metals and that it will not react with lead or chrome-nickel alloys.

Two materials are used to prepare the mortar—a potassium silicate solution which is entirely new, and a powder packed in 100-lb polyethylene-lined bags, dated to insure best results within a specified time limit. The company recommends this special type of mortar for laying acid-proof brick or tile in combustion gas condensation and sulphuric acid production services; for structures in which maximum bond strength is essential, and where improved impermeability is desired. *Pennsylvania Salt Manufacturing Co.*

Circle 48 on postcard for more data

Under-Drive Mechanical Draw Press

Available in sizes from 500 to 1000 tons capacity, with beds of from 84 by 72 in. to 200 by 100 in., a new welded - steel, under - drive mechanical draw press has the driving mechanism in the press bed for ease of inspection and maintenance. Various cycle sequences may be obtained; the press may have a fast advance and return, and still maintain a safe drawing speed. The swivel arrangement of counterbalance cylinders permits them to align properly when the gibs are adjusted. Package design encloses all piping and wiring within the press structure. Other features are eddy current clutch, and safety die blocks and die lights. (Hamilton Press Div., Baldwin - Lima - Hamilton Corp.)

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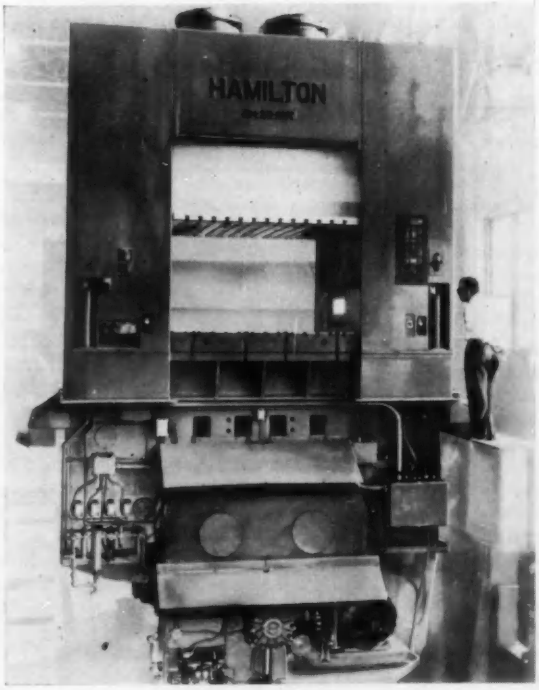

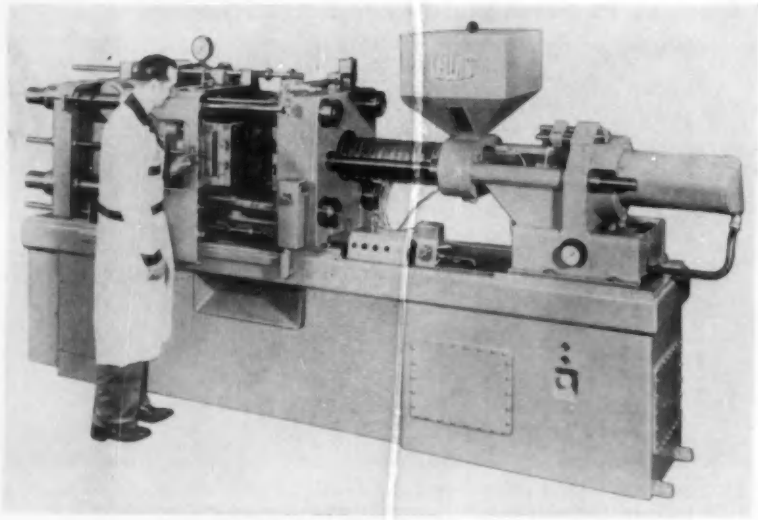

Lewis Model 616-L-12 plastics injection molding machine

Redesigned Plastics Injection Molding Machine

FEATURING increased speeds and capacities, the Model 616-L-12 plastics injection molding machine is the latest development in the "6" series. This completely redesigned machine, as compared with prior "6" models, is said to have 80 per cent faster operating speed, 66 per cent greater plasticizing capacity, 75 per cent more shot capacity, 35 per cent higher injection pressures, and an 80 per cent increase in powerplant output.

The announcement states it dry cycles 360 times per hour, molds up to 20 cu in. per shot, plasticizes 100 lb of material per hour, shoots 12 oz of polystyrene with pre-packing, and will accommodate molds measuring 14½ by 24-in. (mounted either vertically or horizontally). Its redesigned powerplant provides injection pressures ranging up to 21,000 psi.

All operations are timer controlled and are infinitely variable to meet individual molding requirements. Clamp pressure, injection pressure, temperature of molding materials and operating cycle can be adjusted from front side of machine. *Lewis Welding & Engineering Corp.*

Circle 50 on postcard for more data

Test Chamber

DESIGNED to allow interior adjustments without causing sharp environmental temperature changes, a low-temperature test chamber, recently completed, incorporates a special hinged 20 by 20-in. access door which may be opened to permit manual instrument changes and adjustments without completely dissipating the environmental temperature condition. A 40-hp drive shaft penetrates one side of the chamber and is capable of producing from 750 to 4500 rpm. All-automatic programming instrumentation allows for presetting and preselection, reducing technical operation and observation.

The chamber has a temperature range of −100 to +220 F (±2 F); has a relative humidity range of 20 to 95 per cent, 35 to 180 F, 35 F minimum dew point; has a special operation of 5 per cent to +160 F; and has a heat dissipation load of 30,000 Btu/hr at −70 F and/or 3,000 Btu/hr at −100 F. The physical dimensions of the unit are 8 ft wide by 8 ft high by 10 ft deep. *Tenney Engineering, Inc.*

Circle 51 on postcard for more data

Stainless Spray Guns

CORROSION of spray guns and contamination by gun metal of sprayed fluids have been eliminated in a new line of spray guns, according to an announcement. Designated the Model 18SS Series, the guns are equipped with stainless steel heads, nozzles and fluid needles. Stainless steel at these points is said to add considerable life to spray guns used in the application of corrosive fluids.

The Model 18VSS in the series is available with tungsten carbide reinforcement on the needle valve and nozzle. The combination of these hard metals in the fluid ejection components is stated to provide a more corrosion-resistant spray gun for applying materials such as vitreous enamel. The stainless steel series also includes automatic guns in the reciprocating category. *Binks Manufacturing* Co.

Circle 52 on postcard for more data

Conveyorized Degreaser

DESIGNED for automatic feeding, a new degreaser has recently been developed with a motorized conveyor belt at the loading end. Another motorized conveyor at the unload end takes the work off as it emerges from the degreaser. Automatic feed is accomplished by means of special hangers which are located along the inside cross-rod conveyor system in the machine. These hangers pick up work baskets automatically from the feed conveyor, which is activated by limit switches in order to accurately position each basket.

The unit is available in either electric, steam or gas heated models. Vapor level is controlled by a water jacket around the tank exterior. Conveyor speed is approximately eight feet per minute and capacity of the unit is approximately 3000 lb of work per hour, varying with the inherent weight of the metal degreased.

The machine has an overall height of 8 ft 3 in., is 6 ft wide and 15 ft long. It is designed to handle high production cleaning of a wide variety of small metal parts, particularly small stampings which are so shaped that they tend to cling together if cleaned in standard type machines. *Phillips Manufacturing Co.*

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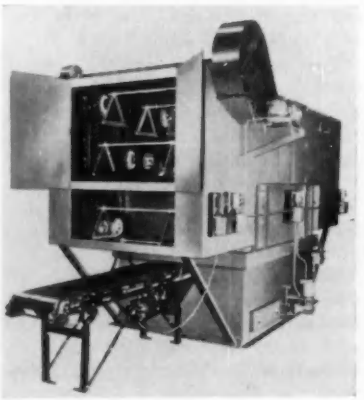
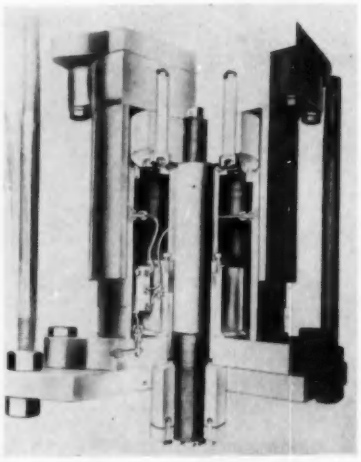


Phillips conveyorized degreaser

Pneumatic Die Cushion

Now available in five different universal sizes is an all-steel weldment pneumatic die cushion. The new improved Model DR is carried in stock in sizes from 8 to 16 in., having a ring holding pressure from 5 to 20 tons. It is provided with a new high pressure positive lubricating system with an internal guiding means to compensate



Dayton Rogers Model DR die cushion

for the off-center loading of the furnished hardened and ground pin pressure pad.

This heavy die cushion is of universal application and is said to be applicable to practically any power press. *Dayton Rogers Manufacturing Co.*

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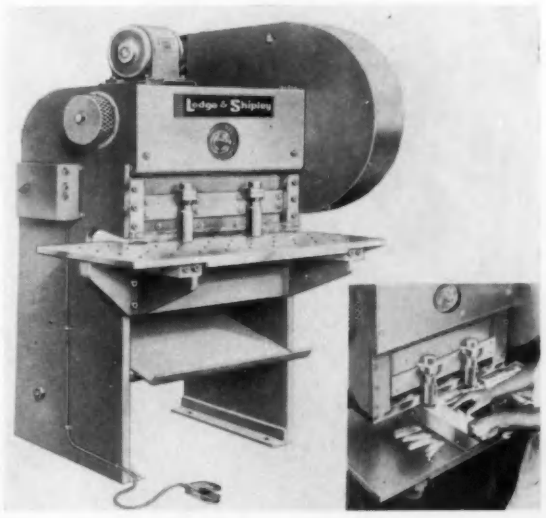


Lodge & Shipley 24-in. speed shear is compact, being 72-in. high, 50-in. wide and deep. The insert shows sequence shearing of aluminum gussets in an aircraft plant. First operation (on left) is cutting to size; second operation is bevel shearing of blank ends.

Production Shear for Small Fabrication

Built for fast heavy-duty power shearing, a new production shear has a blade length of 24-in., a throat 7½-in. deep and capacity up to ⅛-in. in mild steel. It operates at speeds up to 120 strokes per minute. Designed for versatility in small sheet shearing, the unit will do straight and angle shearing, sequence shearing, slitting, notching, blanking and duplication of straight-side parts without dies.

The special "end-around" table extends around the left end of the blade for convenience in notching and slitting. The table is provided with tapped holes for setup of protractors, clamps and cutting guides. For conventional shearing, the shear has a front-operated back gage. Among other features of the new shear are: all adjustments in front, counter thrust slide for burr-free cutting, solenoid-operated safety clutch, work chute discharges to front or rear, foot control switch and machine mounted pushbuttons, selective operation: continuous or single stroke cutting, fully enclosed drive, and a fluorescent light gage which illuminates table and provides for shearing to a scribed line.

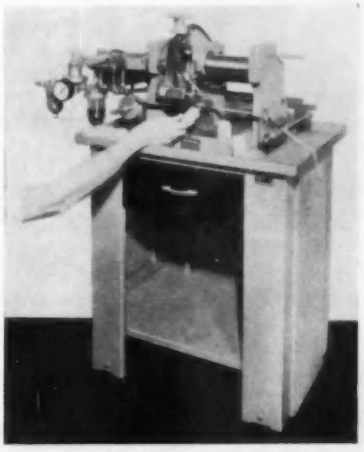
It is furnished with a 1½ hp drive motor and three-belt vee-drive. Protractor and guides for cutting are furnished. Capacities listed by the manufacturer include ⅛ in. in mild steel, 3/32 in. in stainless steel and 7/32 in. in duraluminum. *Lodge & Shipley Co.*

Circle 55 on postcard for more data

Marking Machine

Marking of plastic products, as well as metal parts, is said to be now possible with a new larger model marking machine. The plastics marking includes all thermoplastics and also, in many instances, thermosetting plastics. The machine is designated as the Model 9AH and it is driven by an air cylinder provided with foot or hand valve. In high production lines, this valve can be electrically controlled.

Standard stroke is six in., but being adjustable it can be reduced to meet any marking requirement. Long stroke models are also available. Up to 1000 marks per hour can be produced depending upon the size of the part and the manner of feeding. The illustrated machine is shown being manually fed a cup-shaped part of thermoplastic which is marked with calibrations and numbers in color. The marking feed is automatic and a complete marking can be accomplished at each stroke of the press including the application of color.



Acromark Model 9AH machine

This machine is dual purpose in that by disconnecting an electric heating element and by stopping the tape feed, the machine is adaptable to the marking of similarly shaped parts of steel or other metals, and by changing of the holding fixture it is adaptable to the marking of various sizes and shapes of parts.

Power is provided by standard air line up to 150 psi. The electric heating element is 110-v. *Acromark Co.*

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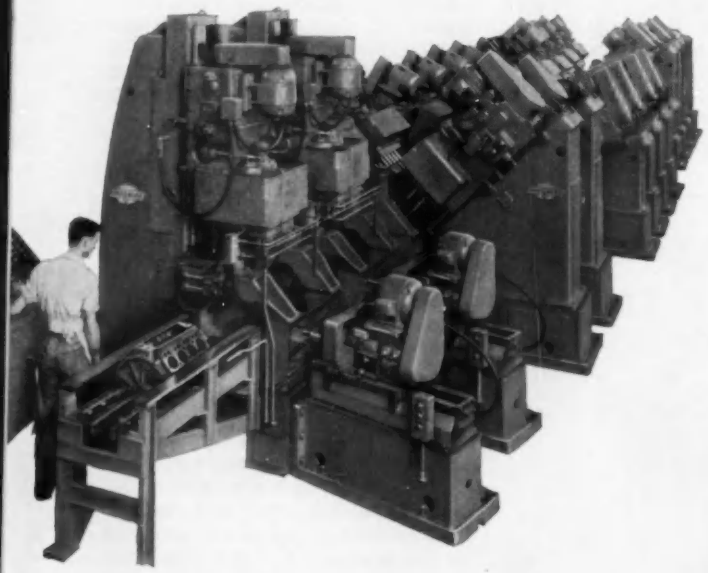

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Pictured is one of four Greenlee assembly floors. This newly constructed, block-long building covers almost two acres of ground . . . provides a well-lighted, roomy area for erecting and testing Greenlee Transfer Machines similar to the ones illustrated.

This 17-Station Greenlee Transfer Machine, the first in a line of three . . . carries 152 tools. It automatically drills, countersinks, cleans and gauges holes in V-8 cylinder blocks. Take advantage of Greenlee's specialized assistance in planning for automatic production. Write or wire today for a consultation.

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FREE LITERATURE

Screw Machines 1

An illustrated catalog describes in detail recent design and production advances in single spindle bar automatic screw machines. *Gear Grinding Machine Co.*

Industrial Drives 2

The features and applications of four styles of variable speed transmissions for machines using up to 10-hp vee-belt drives are described in a 12-page catalog published by *Maureymatic Div., Maurey Mfg. Corp.*

Vibration Control 3

Bulletin SVC-55 outlines the basic theory of vibration isolation and shock absorption of machinery and reviews practical methods of control. *Industrial Div., T. R. Finn & Co.*

Heat Processing 4

Bulletin 560 outlines standard types of ovens designed and produced for heat processing in the fields of ceramics, chemicals, metals, paints, plastics, rubber, etc. *Lanly Co.*

Plastic Products 5

Bulletin 6905 provides information on the chemical and mechanical properties of Teflon and Raylon, and also includes specifications on the various sizes in which sheets, tape, molded and extruded rods and tubes made of these materials are available. *Raybestos-Manhattan, Inc.*

Vacuum Pumps 6

Bulletin 403, four pages, lists small, air-cooled compound high vacuum pumps, which include six models ranging in size from a ¼-hp unit to a 3-hp unit having displacements of 2.0 and 46.0 cfm, respectively. *Kinney Manufacturing Div., New York Air Brake Co.*

Thermocouples 7

Catalog 1556, 28 pages, lists a complete line of thermocouple assemblies and pressure sealing glands. *Conax Corp.*

Analog Computers 8

Data File 121 is a simplified introduction to the basic theory and application of electronic analog computers. It explores the various aspects of simulation and features a presentation on electronic analog simulation equipment. *Berkeley Div., Beckman Instruments, Inc.*

Jet Engine Testing 9

Bulletin 5101 describes the design features of a jet engine test facility for remote electrical measurement of thrust, and includes descriptions of instrumentation for indicating or recording engine thrust and pressures as well as fuel or lubricant flow. *Electronics & Instrumentation Div., Baldwin-Lima-Hamilton Corp.*

(Please turn page)

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Resistance Welders 10

Bulletin G-100, six pages, covers a line of standard and semi-standard resistance welders, as well as special welders designed and tooled for specific production requirements. *Precision Welder and Flexopress Corp.*

Industrial Furnaces 11

A catalog describing a complete line of industrial furnaces and ovens designed for temperatures up to 3000 F has been made available by *L & L Manufacturing Co.*

Temperature Control 12

Specification Sheet S1010-1 covers an electronic temperature controller which is available as a single-point controller, a differential controller, or for cascade control. *Industrial Div., Minneapolis-Honeywell Regulator Co.*

Quenching Oil 13

Technical Bulletin 45 gives the specifications, uses and advantages of a new fast-quenching oil. *Sun Oil Co.*

Toolholders 14

A complete line of toolholders and carbide inserts is listed in Catalog VR-437, 24 pages. *Vascoloy - Ramet Corp.*

Electric Motors 15

Bulletin GAE-6341, eight pages, discusses the design features and maintenance of new induction motors, 1 through 30 hp, for use in hazardous locations. *General Electric Co.*

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AI Index 16, 17

Check 16 on postcard for index to Vol. 114 (Jan. 1 to June 15, 1956) of AUTOMOTIVE INDUSTRIES. A limited number of copies of the index to Vol. 113 (July 1 to Dec. 15, 1955) are also available. Check 17 if you wish this index also. *Automotive Industries.*

Cable Conveyors 18

A 36-page illustrated engineering manual contains detailed information on how to install a cable conveyor system, including a diagrammatic plan for layout and dimensional calculations. *Tipp Manufacturing Co.*

Fluid Power 19

"How Fluid Power Serves Industry and You," a 20-page booklet, tells the story of fluid power's role in industry today and points out its many applications. *National Fluid Power Association.*

Deburring 20

Bulletin BB-1, four pages, describes a method of removing fragmentary burrs from finish machined cast iron or non-ferrous parts. Three basic designs of machines are shown, consisting of stationary machines with manual loading, rotary machines for continuous operation with manual loading, and in-line continuous operating machines with either manual or automatic loading. *Modern Industrial Engineering Co.*

Cylinder Blocks 21

An 18-page illustrated booklet describes a new method of cylinder block construction for mass production. In this design the cylinders are assembled as separate pieces instead of being cast as integral parts of the block structure, and the coolant directly contacts the outside of the cylinders. *Perfect Circle Corp.*

Welding Data 22

A 170-page Pocket Data Book, TIS 2575, featuring simplified welding procedures for every base metal, is available from *Eutectic Welding Alloys Corp.*

Aluminum Digest

A monthly publication containing 50 to 60 reviews of articles relating to aluminum that have appeared in the technical press is being made available to the metalworking industry. Address request to *Desk ES, Reynolds Metals Co.*, 2500 *S. Third St., Louisville*, 1, *Ky.*

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ROTOR
When a manufacturer of hydraulic pumps switched from 8620 steel to Copperweld 8620 Leaded Steel, the life of a set of tools was increased 33⅓% from 7200 pieces to 9600 pieces.
A
Q
KNOCKOUT PUNCH
When the Greenlee Tool Company switched to a Copperweld Leaded Alloy for this knockout punch, their spindle RPM on operations involving turning, drilling, milling and grinding increased 30%, and their tool feed from .005" IPR to .009" IPR.
Q
GEAR
This complex gear, part of the gear assembly for The Frank G. Hough Company's "Payloader," is made in 6 separate operations or set-ups with a tooling sequence of 13 operations. When they switched from unleaded steel to Copperweld Leaded 8620, the faster feeds and speeds gave them a production increase of better than 25%. In addition, tool life increased 60%.
K

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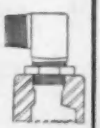

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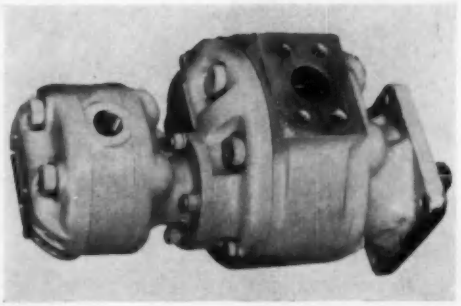
"Miller Fluid Power" is also a division of Flick-Reedy Corp.

NEW Automotive and Aviation

Tandem Pumps

Gear-type hydraulic tandem pumps, designed especially for applications on heavy-duty mobile equipment have been announced. Designated Series 3000-2000, this assembly is intended for applications where two separate hydraulic



Hydreco Series 3000-2000 gear-type hydraulic pumps

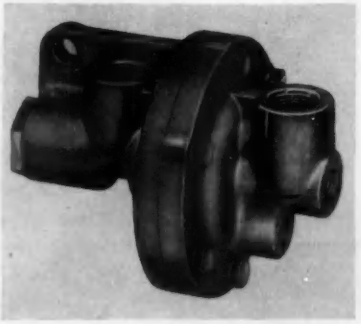
circuits are required. The larger pump operates at pressures up to 1000 psi at 1200 rpm, and delivers 36 to 64 gpm to provide the main hydraulic power source. The smaller pump delivers 10 to 25 gpm, and may be used for auxiliary circuits such as power steering.

Both pumps incorporate pressure-balanced wear plates. By balancing pressure on the front and back of the wear plates, a fixed clearance is maintained between the wear plates and the gear faces, regardless of pressure. This is said to reduce oil slippage to a fixed minimum, and there is no excessive power loss due to the force of the plate against the gears. *New York Air Brake Co.*

Circle 60 on postcard for more data

Air Brake Valves

Two new tractor air brake valves provide both manual and fully automatic tractor-trailer protection when used in combination with any trailer emergency (breakaway) valve. The emergency brake valve triggers emergency



In the event of pressure loss on a trailer or a trailer breakaway, the airline protection valve automatically isolates the tractor air supply, retaining normal tractor brake control

braking on the trailer and may be operated manually at any time; or it will operate automatically when air loss drops pressure to a predetermined value. The tractor

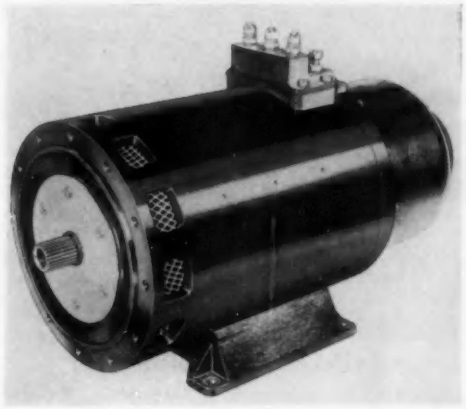
PRODUCTS

airline protection valve automatically isolates the tractor air supply, retaining normal tractor brake control in the event of a pressure loss on the trailer or a trailer breakaway. *Automotive Div., Wagner Electric Corp.*

Circle 61 on postcard for more data

Aircraft Generator

A 160-kva generator designed originally for the a-c power requirements of nuclear-powered planes may have immediate applications in multi-engine aircraft, mobile ground power units, and development laboratories. Said to be the highest rated machine ever designed for aircraft,



Jack & Heintz develop 160-kva generator

it may be used as a turbo-driven replacement for present multi-generator installations, where lower output generators are mounted on each engine.

Designated Model G180, the unit is 22 in. long and 11 in. in diameter; it weighs approximately 260 lb. The generator can be foot mounted or flange mounted, depending on installation requirements. It can be driven by an aircraft engine, either directly or through a constant speed drive, or by gas turbine. The generator is said to be exceptionally cool running and to exhibit excellent wave form and unbalanced load characteristics. *Jack & Heintz, Inc.*

Circle 62 on postcard for more data

Motor-Driven Air Pump

An air pump driven by an electric motor has been designed for a missile-pressurizing application. Designated Model RG-10090-C, this pump can also be used as a high-capacity compressor for supplying oil-free air to electronic components in aircraft, particularly at high altitudes, to prevent arcing of high-frequency current.

The positive displacement, rotary vane pump has 0.8008 cu in. displacement per revolution. Blades are self-lubricating. No seals or packing are used. Blades, rotor and

(*Turn to page 94, please*)

NEW

ABRASIVE ALUMINUM TREAD PLATE

Nonskid—light—no rust

Alcoa® Abrasive Tread Plate is a tough aluminum alloy with skidproof aluminum oxide rolled right into the surface. It's so nonskid you can walk right up a 30° incline—even when it's wet or oily!

This tread plate is ⅓ the weight of steel. It won't rust. It's easy to fabricate. It comes in many thicknesses and sizes.

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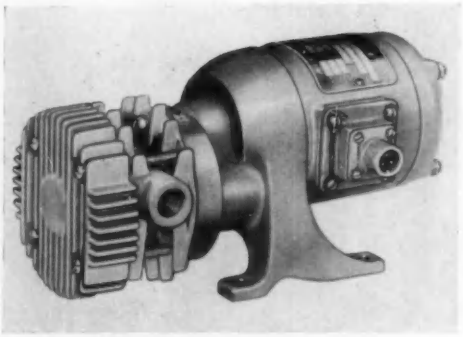
Specialists in Cushion Seating

NEW Automotive and Aviation PRODUCTS

(*Continued from page* 93)

motor shaft are the only moving parts. There is positive starting and pumping at minus 65 F.

Rated capacity of the pump is 700 cu in. per min at 68 F. A check valve built into the outlet port of the pump



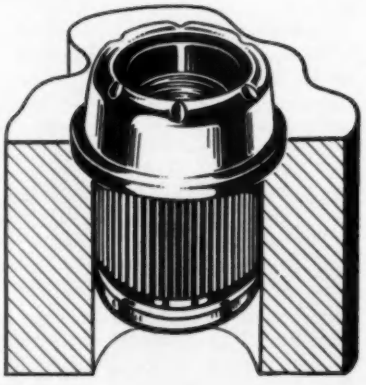
Lear Model RG-10090-C air pump

permits intermittent operation without loss of system pressure when the pump is stopped. The motor is rated at 0.333 hp at 48 rpm and it operates from 115 volts ac, 400 cycle, 3 phase. It is capable of continuous duty at 20,000 ft ambient altitude. *Lear-Romec Div., Lear, Inc.*

Circle 63 on postcard for more data

Self-Locking Spline Nut

Designed to be used as a self-wrenching fastener for aircraft and industrial applications, a self-locking spline type nut is said to provide tighter grip and smoother installation in aluminum and magnesium alloys. The type ND2398 spline nut features a counterbored shank to accommodate "AN" thread length bolts used in aircraft construction. A chamfered pilot on the shank centers the nuts on insertion and assures equal broaching of the installation hole wall by the splines. A chip relief groove immediately behind the pilot allows actual broaching of the hole, minimizes hoop stress in the work, and insures



The self-locking spline nut includes features for accommodating "AN" thread length bolts, minimizing hoop stress and insuring proper seating, and for use in close clearance applications.

proper seating. Reduced flange diameter of the new spline design permits effective use in close clearance applications.

The new spline nut meets AN-N-5 and/or MIL-N-25027 (ASG) requirements and is available in cadmium plated steel in the following thread sizes: 10-32, ¼-28, 5/16-24, ⅜-24, 7/16-20, and ½-20. Shank lengths vary with thread sizes and range from 0.156 to 0.562 in. *Elastic Stop Nut Corp. of America.*

Circle 64 on postcard for more data

Machine-Finished Sheets and Strips

Newly available is a wide variety of machined finishes on pre-finished metals. These metals, obtainable in sheets and strips, can be used for complete product fabrication of small units, as well as for trim and paneling. Barely perceptible to the touch, the patterns are an integral part of the metal after finishing.

Along with affording distinctive styling in product design, the patterns are also said to give a lasting beauty

Machined finishes on pre-finished metals

during product service life. The new type finishes are obtainable in many patterns, stripes in all types of arrangements, combinations and widths, and crimps. *Apollo Metal Works.*

Circle 65 on postcard for more data

Electrical Connector

A miniature electrical connector, known as the Pygmy, has been developed especially for application to miniaturized electronic equipment. The unit is available in both the "A" and "E" styles; in a series for potting; with jam

Bendix Pygmy miniature electrical connector designed for miniaturized electronic equipment applications is available in both the "A" and "E" styles.

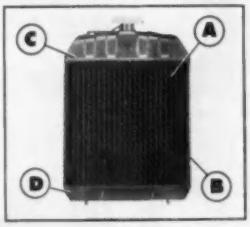
(*Turn to page 97, please*)

Young Engineering Talent Pays off for SAFE-WAY*

*Safe-Way School Bus, built by Marmon-Herrington Co., Inc., Indianapolis, Ind.

Young Side-Mounted Radiators keep 182-hp. bus engines cool

The Problem: To select an engine-cooling radiator built for easy accessibility and efficient upkeep.



Young Stamped Tank Radiator

How Young solved it

Young Radiator Company built a pressurized, heavy-duty fin type unit with a compact, 625-square-inch frontal area. This Young Radiator was side-mounted at rear of bus for convenience and safety. It cools a heavy duty 332-cu.-in. overhead valve V-8 engine developing 182 hp at governed engine speed.

A. Fully-soldered, double lock-seam tubes.

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C. Double-grip 2-way headers.

D. Capacities to 300,000 btu/hr.

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Provide your production lines with a dependable, smooth-flowing supply of America's top quality hose clamps. Specify CORBIN. Write or phone for complete details. **Corbin Hose Clamp Div., The American Hardware Corp., New Britain, Connecticut.**

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BIG BROTHER BENDER

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

Model BBB

SMALLER MODELS AVAILABLE

AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

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NEW Automotive and Aviation PRODUCTS

(*Continued from page 95*)

nut receptacles and hermetically sealed receptacles; and with both a double-stub, quick-action thread and a three-point bayonet lock. Resilient Scinflex inserts are used to resist vibration effects. The standard size 20 gold-plated contacts are of the closed entry type and will not accept oversize probes or pins. *Scintilla Div., Bendix Aviation Corp.*

Circle 66 on postcard for more data

Self-Locking Insert

Nylok self-locking inserts have been incorporated as an optional feature of a complete line of male-thread fasteners, including standard and special products. The Nylok process makes use of the resilient properties of nylon to provide self-locking action on threaded fasteners which might otherwise loosen under the severe vibration to which many screws are subjected.

A nylon pellet is inserted in a hole drilled part way through the threaded portion of the bolt. When the bolt is installed in a tapped hole or a standard nut, the exposed portion of the nylon pellet is compressed between the mating threads. In attempting to regain its original shape, the nylon forces the threads together under pressure. This pressure increases the friction between the metal surfaces, thus resisting the tendency of the bolt to loosen in service in vibrating machinery, vehicles, and appliances. This integrated self-locking device is said to eliminate the need for lock washers, adhesives, and wire locking. *Standard Pressed Steel Co.*

Standard Pressed Steel Unbrako screw features the patented Nylok self-locking insert, consisting of a nylon pellet installed in the threaded portion of the screw.

Circle 67 on postcard for more data

Clearance Light

A new, rubber-mounted clearance light that cushions road shock and permits easy replacement of lens has been designed for use on trucks, trailers and tractors. The

(*Turn to page 98, please*)

FINEST to the COARSEST
IN PERFORATED METALS
AND WIRE CLOTH

and FERGUSON
specializes in perfection

When you need perforated metals, Ferguson is the place to send your requirements. Write to us about your specifications. We specialize in small perforations.

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760 West Polk Street, Chicago 7, Illinois

NEW Automotive and Aviation PRODUCTS

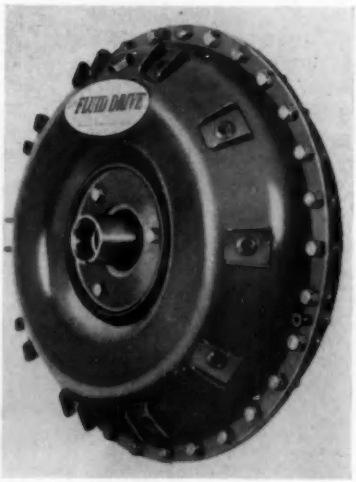
(*Continued from page 97*)

heavy-duty No. C1-201 light has a shock-proof rubber body that prevents loosening of electrical connections. Flexibility of the lens-hugging rubber rim permits easy snap-in and snap-out replacement of the 2½ in. lens, and assures water-proof and dust-proof protection for the wiring. The lights are available for either 6-8 volt or 12-16 volt systems, and come complete with 3 cp. bulb and all wiring. *Auto Lamp Manufacturing Co.*

Circle 68 on postcard for more data

Fluid Drive

A traction type fluid drive, designated Size 126 Type T, is designed for industrial use with internal combustion engines in mobile material handling vehicles and construction equipment. Power rating in these applications is 25 to 85 hp, depending upon drive speed. When modified by installation of a flexible coupling on each end of the fluid drive, the new unit is well suited to constant-speed electric motor applications for driving production and processing equipment, machine tools, conveyors and other materials handling installations. As a motor driven unit, the Size 126 fluid drive is rated at 7½ to 15 hp at 1200 rpm drive speed and at 25 to 50 hp at 1800 rpm.



Size 126 Type T Gyrol fluid drive for use with engine drives. The unit attaches directly to the engine flywheel and bolted either at the flange or hub bolting circle.

Dimensions for the basic unit are 7⅛ in. over the shaft and 14-15/16 in. OD. Overall length for the modifie dunit is 10-13/16 in. *American Blower Corp.*

Circle 69 on postcard for more data

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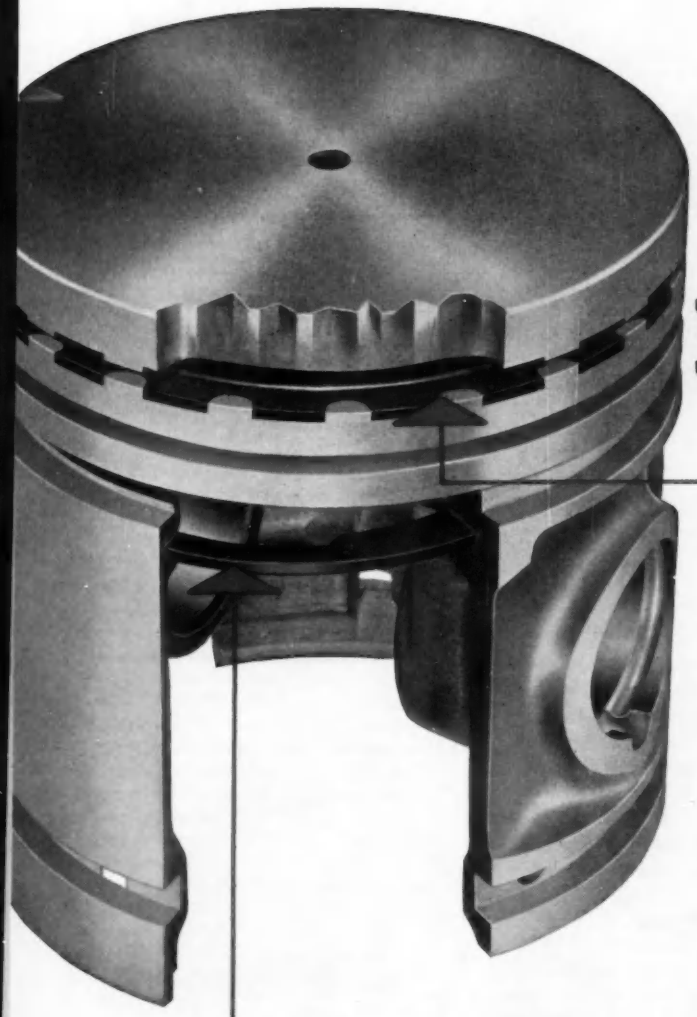
Synthetic rubber extrusions—molded shapes—sheets. Cut parts produced to close tolerances and S.A.E., A.S.T.M. specifications.

NOW! STERLING CONFORMATIC PISTONS



CONFORMATIC STEEL CONTROL MEMBER, anchored at the pin bosses only, controls skirt clearance . . . hot or cold! The metered steel insert allows you to specify the piston clearance you want for your engine. (Clearances from zero to ½ thousandth inch are generally recommended.)

are available with LOW COST Intra-Cast* STEEL-LINED GROOVES

***Steel protection—top and bottom*—gives sensationally longer life to rings and grooves.**

This ring is *integrally cast* into the piston . . . positioned so that when the grooves are machined, the top ring groove is *lined with steel* and has islands of aluminum for ring cooling. This Intra-Cast steel-protected groove resists enlargement and materially reduces top ring land wear and rounding. And, it does it at far less cost than other methods.

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STERLING ALUMINUM PRODUCTS INC.

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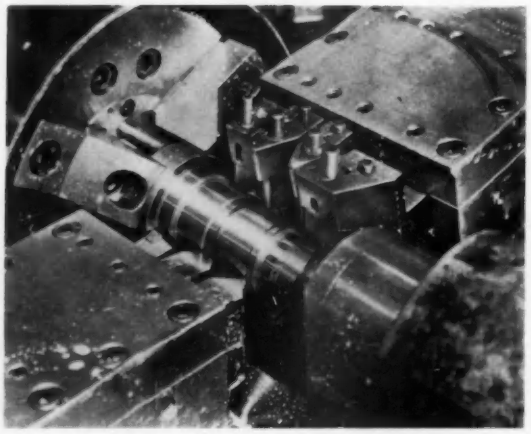
New Tooling Setup for Machining

Automatic Transmission Gear Blank



These Wesson Multicut tools (except the chamfering tool) are indexed once every shift — equivalent to a production of over 1400 parts per grind.

AN example of the way in which new developments in carbide cutting tools can greatly improve overall performance of a given operation without other basic changes in a machine is found at the Ford Fairfax (Cincinnati) automatic transmission plant. It is employing a new method of facing, grooving and chamfering of a reverse sun gear for the Ford automatic transmission on Lo-Swing automatics.

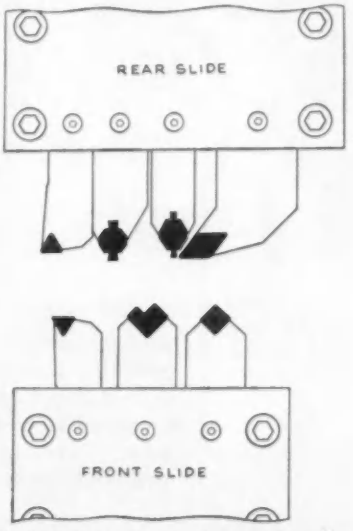
This group of operations used to be performed with brazed carbide tipped tools pre-set in magazines with shims and adjusting screws. Recently Wesson Multicut tool holders with indexable inserts were installed on these machines. Some of the results are summarized in the accompanying table. Involved are two chamfering and rough grooving operations, two finish grooving operations, two facing operations and two "size to length" operations.

There is a saving in total operating maintenance time, including downtime, for tool changes of nearly 90 per cent per shift. The 10 hours formerly required for pre-setting of tools are completely eliminated. Downtime for tool change is cut in half. Grinding and preset time combined is cut over 80 per cent.

The improvement in performance economics is partly traceable to the development of the long - life indexable shallow grooving tool insert by Wesson. These new tools follow the basically standard Multicut band-type holder design with modified standard D-80 inserts. Inserts may be used in four positions, (two for each end) before requiring resharpening.

These tools do not require resetting in the machine when they are indexed to a new cutting edge. Dimensions — even though specified in tenths — are automatically maintained in indexing. Grinding costs are significantly low since no form grinding is required. Top and bottom are simply ground down a few thousandths per sharpening. Resharpening all seven inserts at both ends in the Ford setup requires only 45 minutes.

TOOL TYPE	PRESENT INSERTS
Number of machines	2
Number of shifts	2
Cutter Grind Dept. grinding[time per set-up (tools)	45 min
Cutter Grind Dept. pre-set and set-up block time	0
Pieces per grind (1 machine)	1,410 average for all corners
Number of sharpenings per tool or insert	15
Total pieces per set of tools or inserts	21,150
Number tool changes per day (1 machine) 8 hours	1 complete * unit change
Total downtime for tool or block change —per shift	40 min
Total pre-set time	0
Total cutter grind pre-set & sharpening time—per shift	45 min
Total Operating[Maintenance]Time	2 hr, 10 min

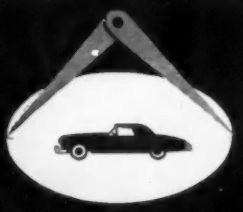


Tool blocks for the Lo-Swing automatics used to machine reverse sun gears at Ford Cincinnati. All tool holders are Wesson Multicut band-types with indexable inserts.

Using

DU PONT ELASTOMERS

NEOPRENE • HYPALON®



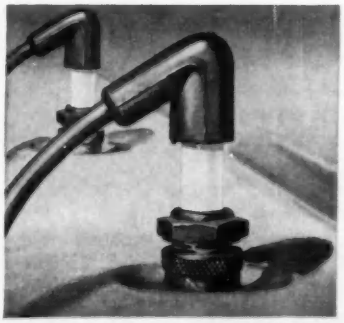
in Design

HYPALON® solves some heat and ozone problems for resilient materials

HYPALON is completely unaffected by ozone, and, when it is compared with other kinds of rubber, it also shows unusual resistance to hardening at elevated temperatures (250°-350°F.). These two facts offer new opportunities to design engineers who are faced with the problem of using resilient materials in today's high-powered engines.

Already HYPALON is being used in molded spark-plug boots (see photo below) and ignition cable jacketing. In these applications, HYPALON's superior resistance to heat, plus the fact that it is completely unaffected by ozone, makes it a logical choice. HYPALON is the most economical choice in the long run, too, because it gives an extra-long service life to any product exposed to heat and ozone.

HYPALON has many other uses in the automotive industry. It's being used as a protective coating on rubber door stripping for automobiles because it protects against deterioration by sunlight and weathering. Durable HYPALON also can be compounded in an unlimited range of *light-fast* colors to blend with the modern fabrics and exterior paint colors of today's cars. These are just a few examples. For further information on HYPALON, just mail the coupon.



MOLDED spark-plug boots of HYPALON withstand high temperatures, are unaffected by ozone.

NEOPRENE - nylon diaphragm solves oil deterioration problem for Fifth Ave. Coach

NEOPRENE-nylon diaphragm (a) is still in good condition while cotton-natural rubber diaphragm (b) is worn out. Close-up shows raised seals (c) that prevent air leakage around bolt holes.

Neoprene chosen as standard for air-brake diaphragm

After extensive road testing on some of its toughest routes, Fifth Avenue Coach Lines, Inc., operator of some 1,300 buses in New York City, has standardized on a new brake diaphragm made of neoprene reinforced with nylon fabric.

The company formerly used natural-rubber diaphragms reinforced with cotton fabric. In these diaphragms there were two principal kinds of failure. Oil in the air supply softened and blistered the rubber, and push rod overtravel tore the fabric. The company decided to try nylon instead of cotton, and neoprene instead of natural rubber.

At the end of 18 months, during which 200 neoprene-nylon diaphragms had been tested, company engineers found that not a single diaphragm had been deteriorated by oil and that the nylon reinforcement was still intact. Average life—about twice that of the old cotton-rubber diaphragms.

Designing with neoprene

Unlike ordinary resilient materials, neoprene *retains* its basic rubber-like characteristics despite exposure to grease, oil, heat and weathering. This makes it ideal for an almost unlimited number of automotive uses . . . in gaskets, trim, hose and tubing, ignition-wire cover, couplings, seals, door strips and other places. To determine how you can best profit by a proper application of neoprene, clip and mail the coupon below.

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METALS

No Real Hardship Yet for Most Steel Users Because of Strike. Steel Scrap Is in Demand. Zinc Shipments Down.

By William F. Boericke

High Inventories Lessen Impact of Steel Strike

The third week of the steel strike found surprisingly little evidence of concern among steel consumers. It is now recognized that inventories at the start of the strike were generally so high that no real hardship would be involved if the shutdown did not continue for over a month. It was even declared in some quarters that a full 30-day period of low steel production, or about 10-20 per cent of normal output, would probably permit a sufficient amount of inventory liquidation to strengthen the overall demand-supply situation. A reliable estimate of inventory of finished steel at the start of the strike was placed as high as 18-20 million tons, about a three-month supply.

This might convey better cheer if it were not known that inventories were decidedly out of balance before the strike. While flat rolled products were becoming easy to obtain for July and August delivery, structural shapes were far behind, especially for bridge construction which, because of the Federal highway program, might well be in heavy demand for a decade. Pipe manufacturers were booked for months ahead with orders running into the third quarter of 1957. Tin plate and electrical sheets were in tight supply and concrete reinforcing bars for the booming construction industry were wanted.

Nevertheless through the first half of July no consumer had to shut down for lack of steel although operations were curtailed by some fabricators. Steel was still produced by a few mills which either had independent unions or had agreed with their workers to carry on with retroactive wage adjustments when settlement had been finalized for the industry. Warehouses were generally well stocked up and aided consumers who were low on steel, at higher prices, up $5-$12 per ton. Heaviest increases were naturally made on plates and structurals.

Steel Prices Promptly Raised

Those steel mills that continued to operate with retroactive wage increases promptly hiked their prices to represent their best estimate of the increased labor cost on steel presently being produced. These price increases ranged from $8.50 per ton for hot-rolled sheets to $10 for cold rolled, and $12 for galvanized. Pig iron went up $4. Some stainless steel was advanced six per cent, or $60 per ton. The gray market was active with prices 30-50 per cent above mill prices. Higher prices were asked for foreign steel and not much was available because of strong European demand. However, it was reported that the Ruhr mills would consider trading steel for scrap. Conversion deals revived with contractors and makers of heavy machinery paying premium prices to avoid risk of shutdowns.

The ease with which steel prices were advanced, and the readiness of producers to take the step, offers rather convincing evidence of the underlying strength of the steel demand in spite of more than normal inventories in many lines.

Scrap in Demand

In spite of the loss of 90 per cent of steelmaking capacity, steel scrap was in good demand with many producers anxious to build up inventories. Their belief was that scrap prices would rise when the strike was ended. Some of the principal sources of supply have temporarily dried up, notably the railroads and the automotive industries. The export market continues to take about half the available scrap offered for sale.

Secondary Aluminum Eases

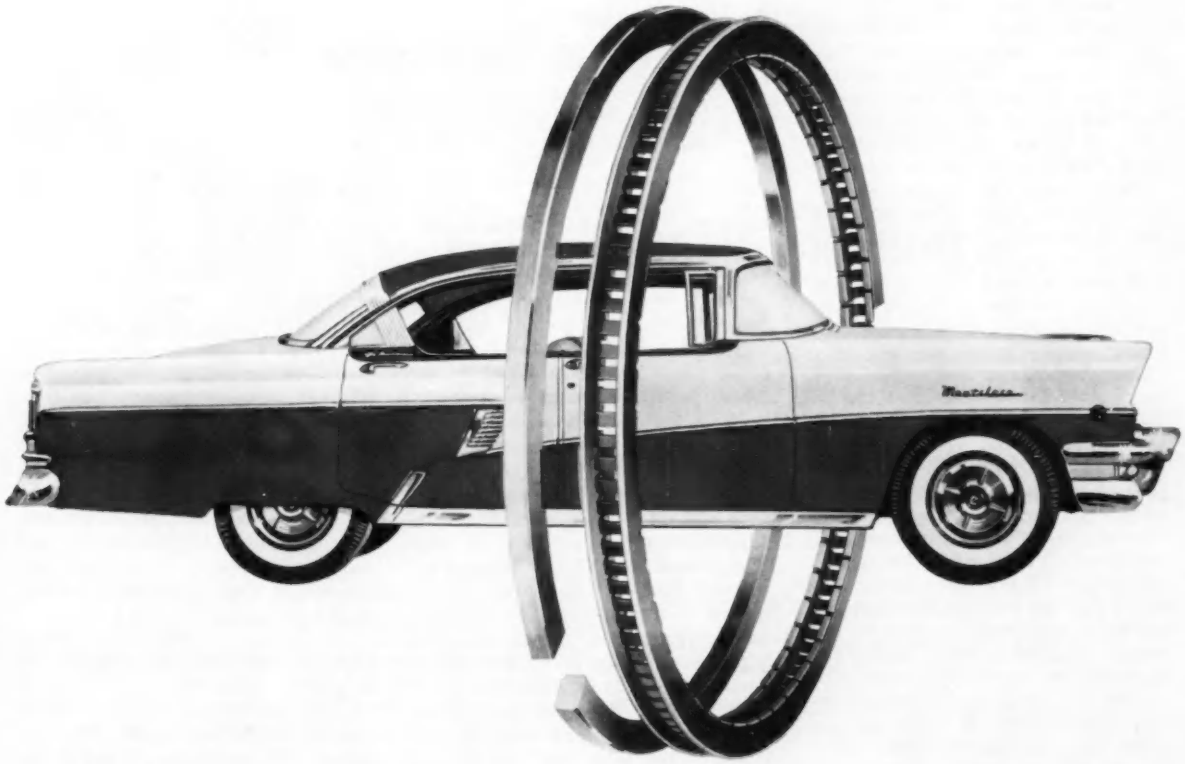
Secondary aluminum prices are sagging below primary metal. For a long period they were as much as eight cents per pound higher than primary. The slightly easier demand reflects in part the impact of the steel strike and the automobile cutbacks, as well as larger production as shown by the latest monthly output figures of 150,800 tons, a new high.

The four companies that make primary aluminum can hold the price with less effort than the 60 smaller producers of secondary ingots who sell chiefly to foundries and die casters from whom demand is variable. The price situation is somewhat parallel to that encountered in the copper industry where the market for secondary is extremely sensitive to demand-supply, compared with the producers' price for electrolytic metal.

Alcoa's present wage contract expires at the end of July. It appears likely that agreements with the union will follow the general pattern to be adopted by the Steel Workers and the steel companies. If this is done, an increase in the aluminum price to cover higher labor costs appears certain.

(*Turn to page* 104, *please*)

Designed for **DUTY**



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2 in 1 chrome piston rings... the standard of comparison

METALS

(*Continued from page* 102)

Copper Cut

As has been long expected, the producers cut their 46 cent per lb price for copper on July 10 to 40 cents. The move had been initiated by the two big Canadian producers and was followed within a day or two by Phelps Dodge, Kennecott, and Anaconda in order. Some Kennecott officials are said to have been sorry they did not take the lead, as it is well known that the Company has been opposed to the high price for many months.

While the six-cent cut is the largest price change ever made at one time in copper prices, nothing less appears to have been justified. Custom smelters had reduced the price to 37½ cents, on the London Metal Exchange copper had traded as low as 32¾ cents, and secondary copper sold at 28 cents per pound. Since then the London price had firmed up to 37½ cents.

No doubt other factors speeded up the price reduction. New labor contracts with the unions assure continued copper production and have virtually eliminated danger of strikes that caused the shortage of metal in 1955. The brass mills have encountered slack demand from Detroit because of the cutback in automobile production, and most mills are curtailing operations. Custom smelters reported negligible sales at the 40-cent level. The British Government announced it would start selling 36,000 long tons of copper from its stockpile some time in August, but would endeavor to avoid undue disturbance on the London Metal Exchange. In April the Government released 65,000 tons of copper but at that time the sale had little effect on the soaring market. The situation is different today.

The price cut in copper is being reflected in price adjustments for brass and wire mill products to conform to the lower quotation. However, not much new business is expected until the end of the vacation period in July and August.

It is too early to say whether the 40-cent price can hold. But in mid-July it appears that the producers will make a determined effort to maintain it. The improved tone in London that followed announcement of the new American price suggest that the foreign market will approach the level of New York rather than the reverse.

Zinc Hurt by Steel Strike

The publication of the American Zinc Institute's figures for June gave convincing evidence that all is not well with the zinc industry. Domestic shipments were off about 33 per cent from the 1955 monthly average and Washington apparently had to step in to buy surplus metal at a sharply accelerated rate to prevent price weakness. Government purchases amounted to over 20 per cent of the total production. At the end of June stocks of zinc had climbed to over 70,000 tons, the highest figure for 14 months.

The low level of automobile output has hit zinc die casters hard. The automobile industry takes 60 per cent of the annual production of some 400,000 tons of zinc-base alloys and the 30 per cent cutback in Detroit has had a serious impact on order books of the die casters.

The steel strike has dealt galvanizers a body blow and cancellations have been heavy for zinc in consequence. The strike will have a more depressing effect on zinc than on other metals.

NEWS OF THE MACHINERY INDUSTRIES

(*Continued from page* 79)

veloped which would make use of automatic handling, machining, gaging, controlling, assembly, and testing. Then, according to Mr. Aller, these plants would be operated at extremely low speed or for short periods to produce the necessary limited stockpiles of material. Without additional equipment or trained manpower, their production could be increased many fold as the needs of the past wars have indicated. He went on to tell the group that feedback controls on "in process" or "post process" gaging would not only reduce scrap but allow an operator to handle many machines more efficiently then he normally does one of the older vintage. His particular objective is to devise and build "push button" production plants that will automatically gage and control quality more effectively than has ever been possible. He stated that in the defense industry plants must be particularly flexible so that new tooling can be rapidly and easily installed with a minimum of change in the basic control and gaging components of the system.

Around the Industry

During a recent Vickers machine tool forum, there was much discussion on hydraulic straight thread fittings. L & L Manufacturing Co.'s latest fitting is the CN type that adapts to a 30 deg angle port. This fitting does not require an "O" ring.

Warner & Swasey has installed three new worm grinding wheel type gear grinding machines to increase its production capacity, and the company has recently ordered another of these machines to handle gears up to 28 in. diam.

Frank B. Stallings of Cleveland has acquired the machine tool and pedestal grinder lines of the Bradford Machine Tool Co. of Cincinnati. The plant will be moved to Lansing, Mich., to become another Universal affiliate. A new company has been formed which will be called the Bradford Machine Tool Co. of Michigan.

E. W. Bliss Co. of Canton, Ohio, has purchased John Robertson Co., Inc., Brooklyn. Robertson is the supplier of lead extrusion presses and related equipment. The plant will operate as a wholly owned subsidiary of Bliss.

The DoALL Co. has a new educational service which it is offering to industry. This service will teach quality control men "How to Be Their Own Bureau of Standards." The program, endorsed by the National Bureau of Standards, is offered in a free training course at DoALL. It will reveal the procedures to be employed by gage block users to inspect and calibrate with assured accuracy their own gage blocks with relatively inexpensive equipment.

The Cross Co. has opened an engineering school to train machine designers for the firm's automation machinery and special machine tool building operations.

Cincinnati Shaper will enlarge its Whitewater shop. It is scheduled for completion early in 1958. The company will then consolidate all of its operations at Whitewater.

Fit Like a Cartridge in Close Quarters

O-M CYLINDERS TIE-RODLESS

(150 PSI AIR—UP TO 1500 PSI OIL)

These compact, streamlined cylinders, that require ⅓ less installation space than the conventional type, slip easily into the hard-to-reach places, because the O-M Special Interlocking Mechanism eliminates both tie-rods and projecting end caps. Besides, the precision honed, seamless steel cylinder body can be turned down to fit in unusually tight spots.

Other important features that reduce maintenance costs and step up efficiency include:

- ***Two point Bearing,*** one on piston and one in rod gland provide better balance and protect against drag on rod—giving O-M the lowest co-efficient of friction at low or high speeds;
- ***End Covers*** (head) machined steel;
- ***Leather Back-ups*** on Hydraulic cylinders prevent extrusion on end plugs—O-ring seals;
- ***Piston Packings***—self-adjusting U-cup, Vee, or ring type;
- ***Rod Packings***—self-adjusting U-cups for air, Vee-type for oil;
- ***Rod Scraper***—cleans piston and protects rod, packing and bearing;
- ***Mounts***—interchangeable, ductile iron or steel—easily installed without disassembling the cylinder;
- ***Ports*** can be oriented to facilitate piping;
- ***All Cylinders*** tested at operating pressures before shipment;
- ***Cylinder*** easily disassembled, inspected, serviced, and re-assembled.

Available in a full range of sizes (1½" to 8" bores) with standard, 2 to 1, or oversize rods with male or female rod end, and length of stroke to meet your requirements. Completely interchangeable parts.

Write TODAY for FREE catalog showing cylinders and complete line of mounting brackets.

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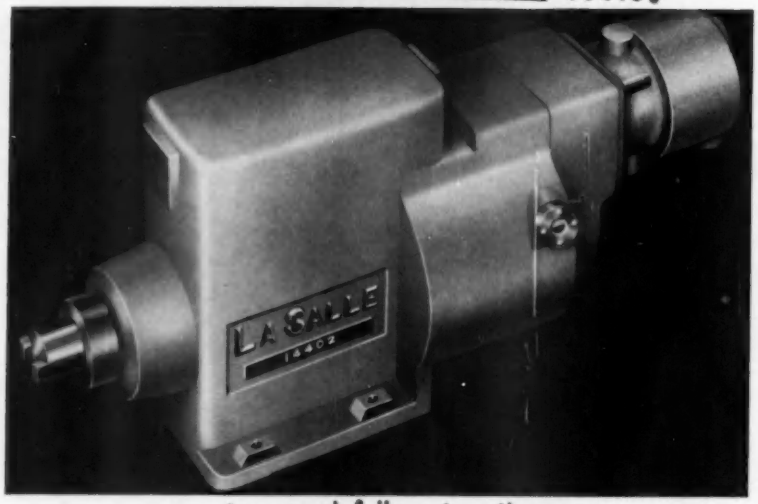
practically eliminates breakage of cutting tools!



IT'S NEW!

two-speed fully automatic power

It's synchronized with the machine cycle to give you automatic engaging and disengaging of parts. Controlled torque eliminates positively all guesswork in clamping pressure.

operates on machine tool principles

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features fluid motor drive

You can clamp light parts or parts with thin-walled areas without fracturing and you can always repeat the clamping torque from cycle to cycle.

fits any type of production machine

They're designed to fit any special or any standard machine in use today—such as Multiple-Drilling Machines, Lathes, Boring Mills, Grinders, Screw Machines or Thread Millers

GOOD NEWS FOR PRODUCTION MANAGERS!

unit mounted quickly

The design permits either vertical, horizontal or angular mounting—to serve your particular needs.

now available in two standard sizes

Smaller model has a torque capacity up to 1200 inch/pounds; larger model from 800 to 5000 inch/pounds. To control and regulate properly a hydraulic power package is provided.

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ENGINEERING & BUILDING SPECIAL MACHINERY

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Simplified Method of Machine Tool Cost Analysis

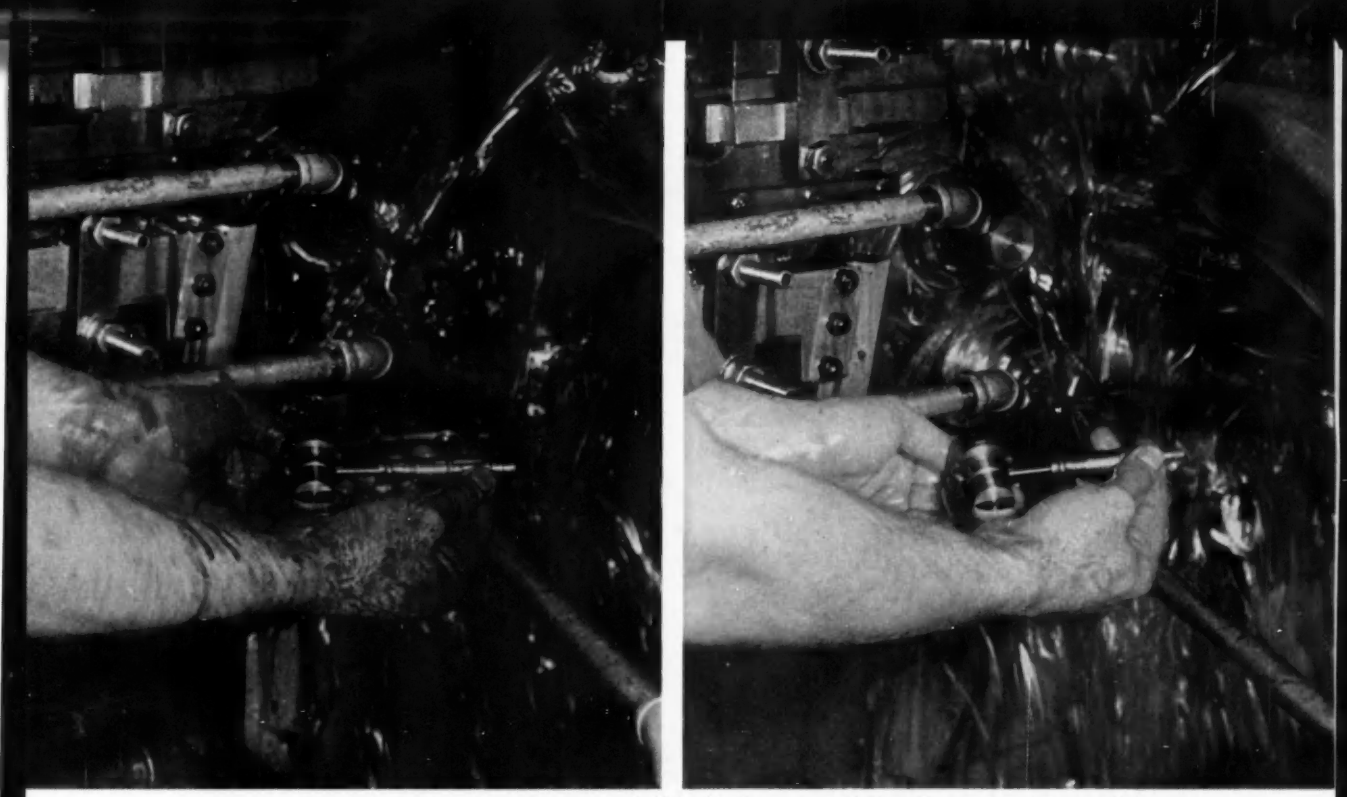
(*Continued from page 72*)

Typical for the nomogram is that the analysis operation can be started from any part of the chart until finally the axis is reached which gives the value of the unknown variable. Another advantage of the nomographic chart is that even in those cases where the exact factors are uncertain the operation still can be performed by using a limit of the unknown factor and thus wind through the chart with two values of a factor. The result will then show two values due to the limiting of an approximate factor.

A line drawn from the scale A to the value of the depreciation factor will multiply these two values on scale B. This point has to be marked. Moving to scale F a line is drawn through the scale of the cost of floor space which will give the product of this multiplication on the scale E. The points of scale B and E are now connected and perform an additional process on scale C. This new point on scale C is connected with the proper utilization factor and is projected to scale D. The distance of this point of intersection from the origin (O), is then transferred to scale L by the arc of a circle about the origin (O). The scale L gives the reciprocal value of scale D. The new point on scale L is marked again while the rest of the operations are going on. Choosing K on scale G and the direct wages t_r as well as the unproductive wage factor z renders the total hourly wages on scale H which point also is marked. Moving over to scale N, the value of the cost of the electric energy is connected with the value of the power consumption, and projected to scale M, gives their product in which both values are multiplied on scale M. The points on scale H and M are connected. This manipulation adds them on scale I. Finally a connecting line is drawn from scale I to L which intersects scale K at a certain point which gives the true cost of the machine tool in $/hr.

The foregoing is an extract from a paper presented at the 1956 ASME Semi-Annual Meeting in Cleveland.

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED



Black cutting oil (left) makes close control difficult. Operators dislike dirty operating conditions it creates. Close control is easier and workers are happier with transparent Sunicut cutting oil (right).

WHY USE A BLACK CUTTING OIL WHEN YOU DON'T NEED IT?

Sunicut oils give you better visibility without sacrificing machining efficiency.

When trying to maintain close control over machines producing precision parts, operators can be handicapped by "black-oil blindness". It is hard to see the tools, the workpiece, and the finishes. Checking close tolerances is difficult when the graduations on micrometers and gauges are obscured.

Worse still, as the operator sees it, are the dirty working conditions caused by dark oils. His clothes get saturated with hard-to-remove stains, and his hands are black from one end of the shift to the other.

Transparent Sunicut oils help keep your operators happy and will make close control easier ... and transparent Sunicut oils will do the job with no sacrifice in machining speed or finishes.

To get the full story on Sunicut oils, see your local Sun representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-41.

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For any machining or grinding operation...

THERE'S A SUN OIL THAT'LL GIVE YOU HIGH EFFICIENCY AND LOW OVER-ALL COST

No two machine shops have exactly the same problems when it comes to selecting cutting oils...even when they're running the same job. And, until somebody comes up with the truly universal cutting oil, you can't afford to disregard the importance of oil selection. Here's how Sun can help you.

First, Sun makes a complete line of emulsifying and straight cutting and grinding oils. Second, your Sun representative, backed up by field engineers, has the necessary practical experience to recommend the oil that will give you both high machining efficiency and low over-all costs.

For the full story about Sun's cutting oils, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-42.

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Automatic Welding of Lift-Truck Fork Lugs

(*Continued from page* 66)

electrode inclined about 30 deg to the horizontal and in position to start its two o'clock welds, wire being fed by each head from a reel in the usual way. Normally, heads include a hopper from which the flux feeds automatically, but, as the welds are not long, it requires only seconds to put the flux in place with a hand-controlled nozzle. Excess falls through a screen and is recovered for reuse.

When each setup is ready for welding, the operator swings the heads to starting positions and presses a start button. Welds are then made in an automatic cycle that ends with completion of the two welds. The lugs are then unclamped and the fork is ready for removal.

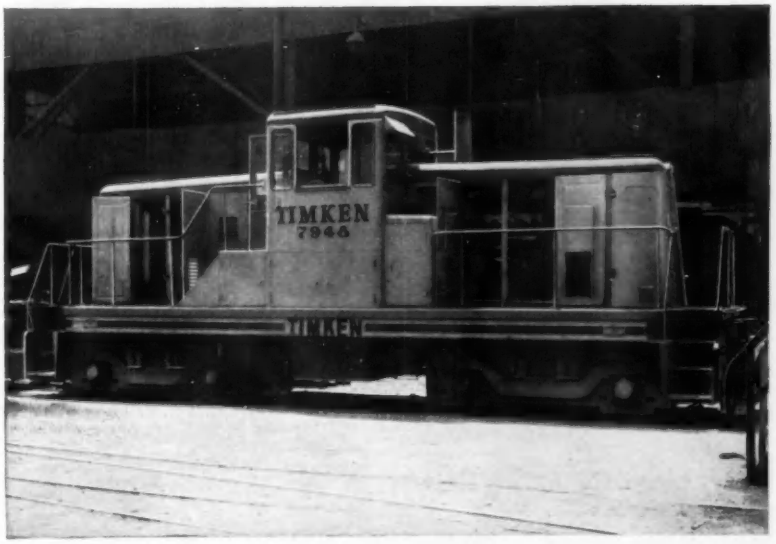
Welds are of uniformly high grade, penetration being better than for hand welding, partly because higher current density is applied. The automatic submerged arc process also eliminates the necessity for preheating, even though high carbon steel is involved.

Forks of different sizes requiring different lugs and lug spacing are produced; hence, the machine is made adjustable by allowing the heads and clamps to move along their horizontal supporting ways at the top of the machine. Either ⅛ in. or 3/32 in. wire is used, depending upon the size of fillet specified. About 12 to 13 forks, each requiring two simultaneous welds, can be put through the machine every hour.

BOOKS . . .

MOLECULAR FLOW OF GASES, *by G. N. Patterson, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York. Price, $7.50.* Although this book is intended to facilitate the transition from the continuum to the molecular viewpoint, the author has included sufficient material from both the kinetic theory of gases and fluid mechanics to develop and illustrate the molecular approach. Among other subjects, Dr. Patterson discusses isentropic flow, basic equations for nonisentropic flow, and the mechanics of rarefied gases. Since sufficient collision information for diatomic moleculares is not available, the mathematical development in the book is complete only for nonatomic gas. However, as Dr. Patterson points out, the results apply equally well to a diatomic gas (air) if the appropriate changes are made. The book includes an appendix that covers mathematical aids, differential equations and their characteristics, and a summary of the derivation of the basic equations of motion of a gas.

TURBO-CHARGING IS NOT NEW AT HERCULES!



2 HERCULES TCD's*

24,242 hours of service in 39 months

Since March, 1953, two Hercules 6-cylinder TCD's have been providing dependable and economical power for this 80 Ton G. E. Diesel-Electric Yard Locomotive #7948. Operating in the melt shop of The Steel and Tube Division, The Timken Roller Bearing Company, these two Hercules TCD's are establishing new records for continuous trouble-free service.

According to log sheets kept by the Timken Company's locomotive shop foreman, this equipment has operated 24,242 hours since it was put in service. Moreover, these hours have been logged under adverse conditions of extreme dust and heat, 24 hours a day, seven days a week for an average of 621 hours a month. Because of this record of performance this locomotive has been nicknamed "Old Reliable" by the men in yard. "Old Reliable" has been serviced under the Timken Company's preventive maintenance program. The TCD's were overhauled at approximately 14,000 hours and will have almost that many hours before the next overhaul.

Other applications of Hercules TCD's such as busses, generator sets, mine cars, marine applications, etc., have established similar record of power and performance. Yes, Turbo-charging is not new at Hercules. TCD is just a new name for a tried and proven product.

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We make no *special* claims to produce miracles with cast steel. Like competitive foundries, problems are similar . . equipment may differ slightly . . it's the *end performance* of the casting that counts!

A little *extra* surveillance in process pays off quality-wise. Customers receive better, cleaner castings . . meeting accepted specifications . . and end up with a lower *finishing* cost. Less scrap . . less re-work . and less lost production time amounts to more than incidentals!

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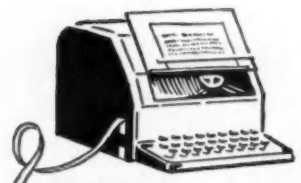

ON OUR WASHINGTON WIRE

Fast blooming of the new road-building campaign is to be reflected in about $1 million in construction contracts by Sept. 1 and up to $500 million by the end of the year. The program is expected to hit an annual rate of $9 billion in outlays by 1960.

Government has decided to omit purchases of nickel, copper, and aluminum in the next 12 months. This means that fiscal 1957 will be the first year since World War II that the Government has not been an active buyer of these metals.

High priced national defense is causing grave concern among toplevel officials in Washington. As things stand now, to keep the Army, Navy and Air Force going at their present strength in the next fiscal year will require an appropriation of about $48 billion —up $12 billion from the present $36 billion.

A recent congressional directive that the Government should "encourage" industrial dispersal will not affect existing defense plants. According to Office of Defense Mobilization, the directive will be used only to strengthen dispersal policies already in effect.

Spending for guided missiles is going to double during the next two fiscal years, a group of labor union economists estimates. Their figures indicate that total expenditures for guided missiles will take nearly 40 per cent of the total Air Force budget by fiscal 1959, as against 20 per cent currently.

Census Bureau figures show that total U. S. population is now about 167.5 million persons. Today's high birth rate emphasizes the need for continued growth of both factory production and distribution patterns.

LAMINATES
LANTUCK AND VINYL COATING...
The success of Lantuck in plastic laminates naturally aroused the interest of other people using plastics. Coaters soon recognized that Lantuck had special advantages as a backing fabric for vinyl. Its random fiber distribution assured balanced strength. It also provided good tear strength and flexibility, smooth surface excellent for embossing, with no "show-through" of weave pattern. And Lantuck offers coaters a high gauge-weight ratio at reasonable cost. Lantuck may be calender coated, laminated, or electronically heat sealed to vinyl film. It is available in widths up to 60".

Take a leaf out of our new Lantuck book

Learn how Lantuck non-woven fabrics make possible new ideas in car upholstery . . . and reduce costs, improve performance.

Learn of Lantuck's versatility in calender coating, laminating to film, electrical heat sealing and high pressure laminating.

FOR FREE COPY of new book explaining the unique advantages of Lantuck non-woven fabrics, write Lantuck Department A8.

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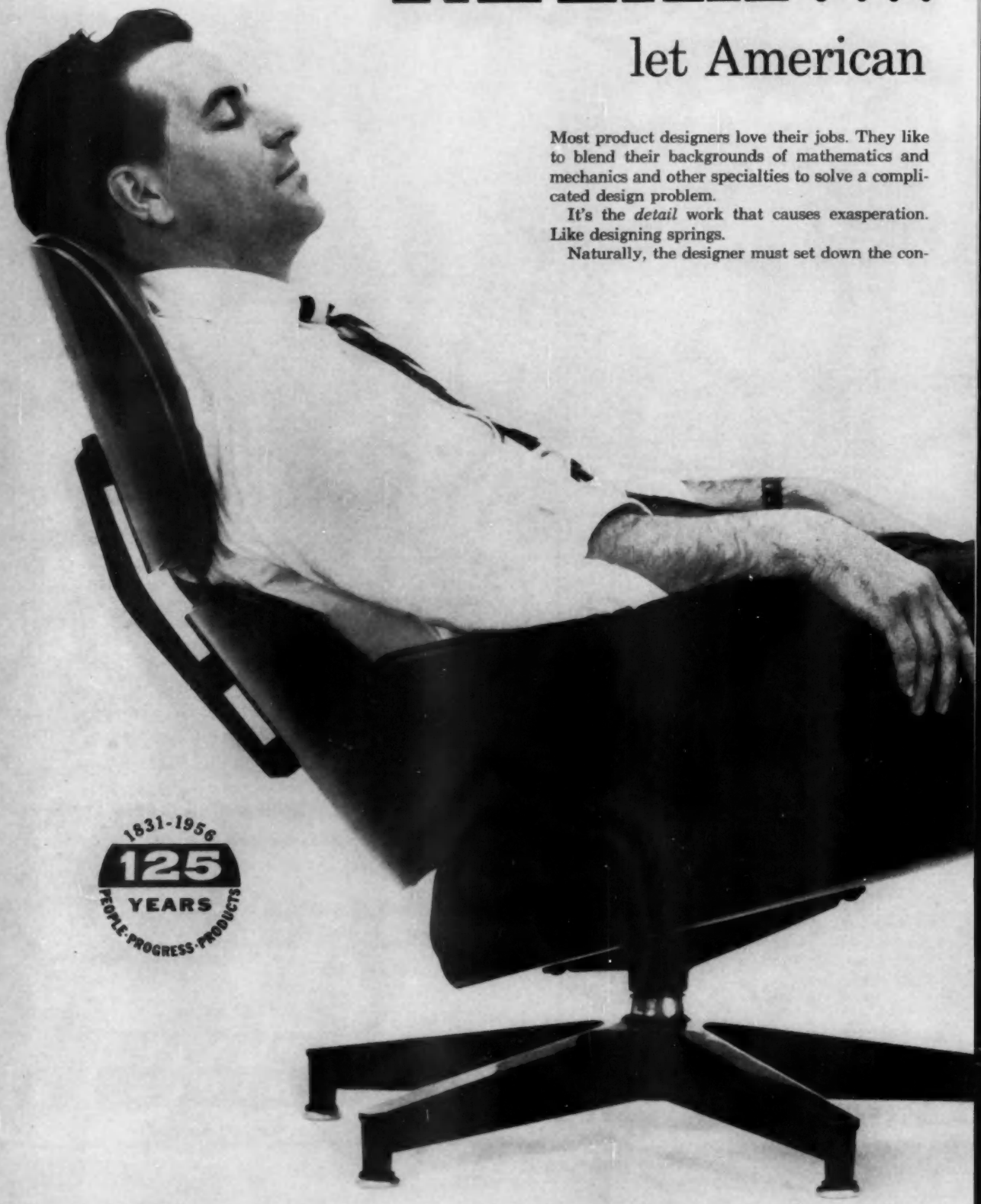

Most product designers love their jobs. They like to blend their backgrounds of mathematics and mechanics and other specialties to solve a complicated design problem.

It's the *detail* work that causes exasperation. Like designing springs.

Naturally, the designer must set down the con-

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125
YEARS
PEOPLE · PROGRESS · PRODUCTS

when you have a spring problem Steel & Wire worry *for* you

ditions of use. He knows how much stiffness he wants, what fastening system is desirable, the limits of spring travel, corrosion conditions and the like. Now, the plot thickens. Can such a spring be produced, in quantity, at a reasonable price?

It is a rare designer who has concerned himself with these practical spring production problems.

For this reason, American Steel & Wire maintains a staff of *spring engineers* to relieve you of this detail. They may be able to suggest a minor design change, or a different grade of steel, or a different finish that will give you a better spring than you contemplated at a decided savings in cost.

Just call your AS&W salesman.

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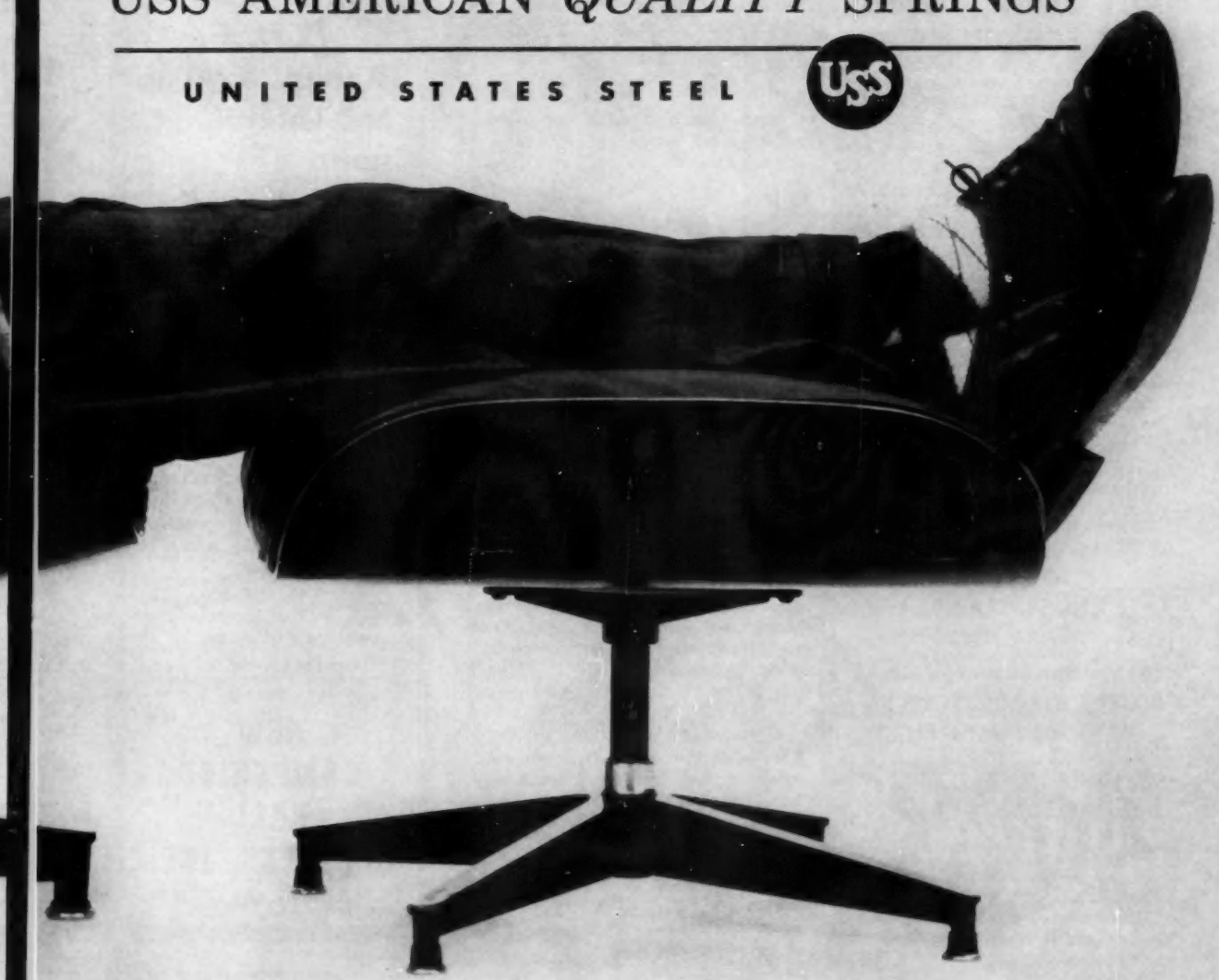
USS AMERICAN *QUALITY* SPRINGS

UNITED STATES STEEL



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BUT GARRETT'S GOT IT FOR QUALITY

No sir, *you can't beat Garrett* when it comes to top quality in small parts. Their "statistical quality control system" means every shipment you get is the finest. But quality is only part of what I like about Garrett. They manufacture and stock the world's most complete line of washers and hose clamps. Boy, when you need any kind of a lock washer, flat washer, spring washer or hose clamp you get it fast . . . most everything right out of stock.

When it comes to stampings and assemblies that's where their high-speed automatic equipment stars. Turns out exactly what you want in no time at all.

Sure, I'm a tough buyer. I want the best. I want it fast. I want it priced right. And Garrett is the place for me.

LOCK WASHERS
FLAT WASHERS
HOSE CLAMPS
STAMPINGS

Manufactured by

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Philadelphia 34, Pa.

Garrett
OF PHILADELPHIA

SHORTIES

Each of the four powerful jet engines of a new U. S. jet transport develops as much equivalent horsepower as that delivered by 58 of one make of high price U. S. car. Yet the $145,000 price of this engine is less than the cost of only one-half this same number of automobiles.

•

About one out of every 10 passenger cars and more than one out of every four trucks is used on the farm—a total of 6.406 million vehicles. Three out of every four farms now have either passenger cars or trucks.

•

More than one out of four pupils in America travel to school by school bus.

•

Fuel cells of a modern jet bomber contain 1500 square yds of nylon and 3000 ft of nylon lacing.

•

Some of the larger U. S. military aircraft consume more than 2500 gal of fuel in one hour. That 2500 gal would take the average passenger car around the world 1½ times.

•

To prove the strength of a giant U. S. jet bomber, the manufacturer had to subject the plane's wing to a stress load of more than one billion lb—as much as the combined weight of eight Forrestal aircraft carriers—before the wing collapsed.

•

Consumers spend more than $38 billion a year to own and operate their cars (not including hospitalization and property damage).

•

Eight out of 10 vacationists travel by car and average 1013 miles per round trip.

FREE DESIGN HANDBOOK!

New!

72-PAGE TECHNICAL MANUAL AND CATALOG ON MICRO-BEARINGS

miniature ball bearings

If you work with miniature instrument-type ball bearings you'll find this new, authoritative publication a complete, handy source of engineering data and specification information.

HELPS SOLVE DESIGN PROBLEMS

Far more than an ordinary catalog—it contains a helpful survey of factors to consider in selecting and applying miniature ball bearings—plus 60 pages of engineering bulletins covering all the aspects of bearings important to designers . . .

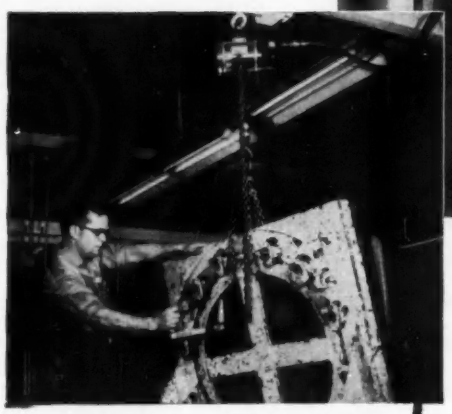
Available types
Radial and axial play
Dynamic and static loads
Lubrication
Torque
Mounting practices, etc. . . .

Sent FREE to Engineers, Draftsmen, and Purchasing Agents
Write for your copy . . .

NEW HAMPSHIRE BALL BEARINGS, INC.
PETERBOROUGH 1, N.H.

AIR LIFT

Faster! *Safer!*



DOUGLAS AIRCRAFT uses ARO Link Chain Hoist in tooling shop at their Santa Monica plant. Shown here, bulkhead fixture being lowered onto flat car.

NEW LINK CHAIN AIR HOIST!*

***ROLLER CHAIN ALSO AVAILABLE—ALL MODELS**

NEW Link Chain Hoist now added to the popular ARO line . . . up to 1000 lb. jobs!

VARIABLE SPEED . . . 0 to 38′ per minute . . . load can be inched or zipped.

AIR-POWERED FOR SAFETY . . . no spark hazard . . . explosion-proof motor . . . can't burn out or overheat . . . unaffected by dust or fumes.

LIGHTWEIGHT . . . only 29 lbs. . . . overall length 10½″. Can be converted to Roller Chain type if desired.

Also available, Roller Chain Hoists—2,000 lb., 1,500 lb., 1,000 lb., 500 lb., 300 lb., 100 lb.

See Your ARO Distributor

THE ARO EQUIPMENT CORPORATION

Bryan and Cleveland, Ohio

Aro of California, 3141 S. Grand Ave., Los Angeles 7
Aro Equipment of Canada, Ltd., Toronto 15, Ontario
Offices in All Principal Cities

ARO®

AIR HOISTS

Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings . . .

XVII

This is the seventeenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Uses of Aluminum in Alloy Steels

Aluminum as an element has been known to chemists and metallurgists for many years. It is never found in nature in its metallic state, being derived chiefly from bauxite, an aluminum hydroxide. Bauxite is present in various parts of the world, including several tropical and semi-tropical regions.

When used in the making of alloy steels, aluminum has several important functions. Because of its great affinity for oxygen, it is a reliable deoxidizer. It produces fine austenitic grain size. And when it is present in amounts of approximately 1 pct, it promotes nitriding. The nitriding process could be described as surface- or case-hardening by means of a nitrogenous medium, or by heating in an atmosphere of ammonia gas and dissociated ammonia mixed in proper proportions.

Other effective agents in producing nitrided cases are chromium, vanadium, tungsten, and molybdenum. As a rule, however, the hardest cases are obtained with aluminum-bearing steels, the nitriding grades being a good example. These are usually steels of medium carbon content with additions of chromium, molybdenum, and sometimes nickel.

Generally speaking, the lower the effective nitriding temperature, the harder the case will be. Aluminum-bearing steels usually show a case-hardness range of 950 to 1150 DPHN (diamond pyramid hardness number). Steels in which no aluminum is present have cases of substantially lower hardness.

If you would care to know more about aluminum as an addition or alloying agent in steels, Bethlehem metallurgists will gladly give you full information. Just write or call us; our technicians are always at your service. They will do everything possible to help make your problems easier. And whenever you need new supplies of alloy steels, remember that Bethlehem manufactures the full range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades.

If you would like reprints of this series of advertisements from No. 1 through XVI inclusive, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 16 topics are now available in a convenient 32-page booklet, "Quick Facts About Alloy Steels," and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

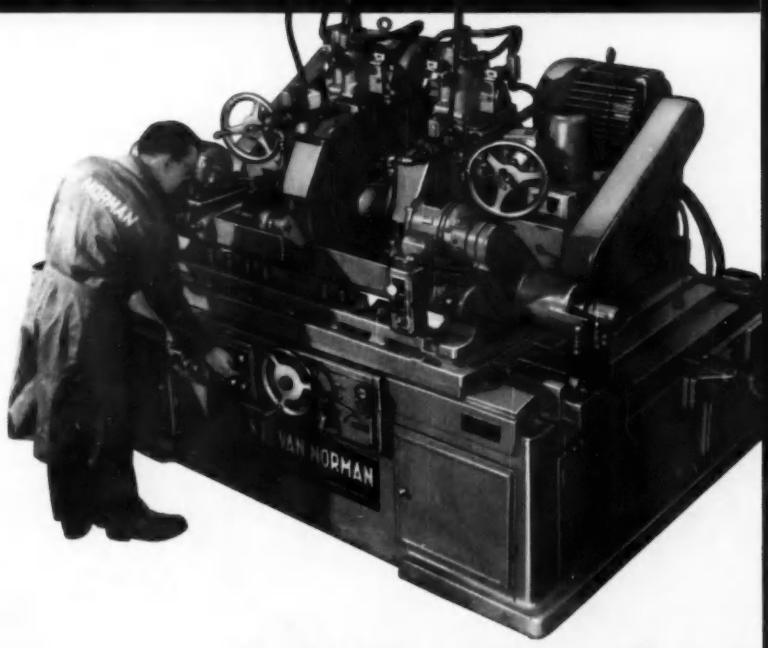
BETHLEHEM STEEL

BETHLEHEM STEEL

Another Manufacturer Chooses G-E Control For Automotive Industry Machines

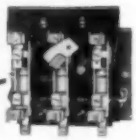
This General Electric factory-built panel provides accurate, reliable control for a new Bowgage Production Grinder, manufactured by the Van Norman Co., of Springfield, Mass. The panel incorporates standard, high-quality G-E starters, relays, switches, and other devices for such functions as interlocking, sequencing, and counting for the automatic dressing cycle.

The control panel circuitry is designed so that this high-production Van Norman machine can grind any automotive part that can be readily chucked. The grinder can remove 0.022 inches on a 1⅝-inch diameter piece, and with operator-initiated automatic clamping can have a new piece ready for grinding every 15 seconds—while holding a 15 micro-inch finish.

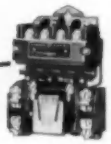


GENERAL ELECTRIC

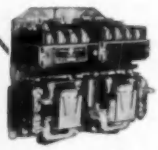
G-E panels for machines like this meet JIC specifications. For some of the devices used in General Electric automotive panels, see the next page.



FUSED DISCONNECT SWITCH — double-break contacts easily visible for inspection—poles can be replaced individually—kits available for changing fuse clips to accommodate other current ratings and voltages.



MAGNETIC STARTER — completely inspected and serviced from the front—easy-to-change heavy silver contacts—exclusive Strongbox coil protected against oil, dust, and accidental damage.



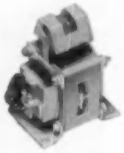
REVERSING STARTER — in addition to the mechanical interlock which prevents forward and reverse contactors from closing at the same time, electrical interlocking can be supplied when specified at no extra cost.

LATCHED-IN RELAY — main and latch coils both have Strongbox construction for long coil life, greater dependability.

MACHINE TOOL RELAY — contacts easily changed from normally open to normally closed—front-connected saddle-clamp terminals make wiring easier—high dependability and easy servicing reduce maintenance—spring attached to movable contacts facilitates installing or removing contacts, assures proper tip pressure.

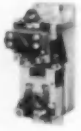
G-E CONTROL for the Automotive Industry

In addition to those shown above, G-E devices include:



●**STRONGBOX SOLENOIDS** with coils molded in polyester resin for longer life, better protection against dust, water, and oil.

●**OIL-TIGHT PUSH BUTTONS** with self-a-line contacts that increase life 2:1—proved by actual load tests.



●**PNEUMATIC TIME-DELAY RELAY** with contacts rated at 25 amps. Wide range of settings from 0.2 to 180 seconds—can be changed to time delay after de-energizing without additional parts — instantaneous interlocks available.

●**6-POLE MACHINE TOOL RELAY** has the same mounting dimensions as 4-pole form—wired from four directions—captive, saddle-clamp terminals, accessible from front, make wiring easy—3-slot mounting.

High quality General Electric control helps protect against interrupted operation and unscheduled shutdowns. Designed and constructed for long operating life, G-E devices assure you of the reliable control required by high-production automotive equipment.

The assembly of standard control components into Pan-A-trol* panels means added dependability for your machines. Also, packaged control in a NEMA 12 enclosure makes inspection and maintenance easier, and helps protect against the entrance of oil, dirt, or moisture.

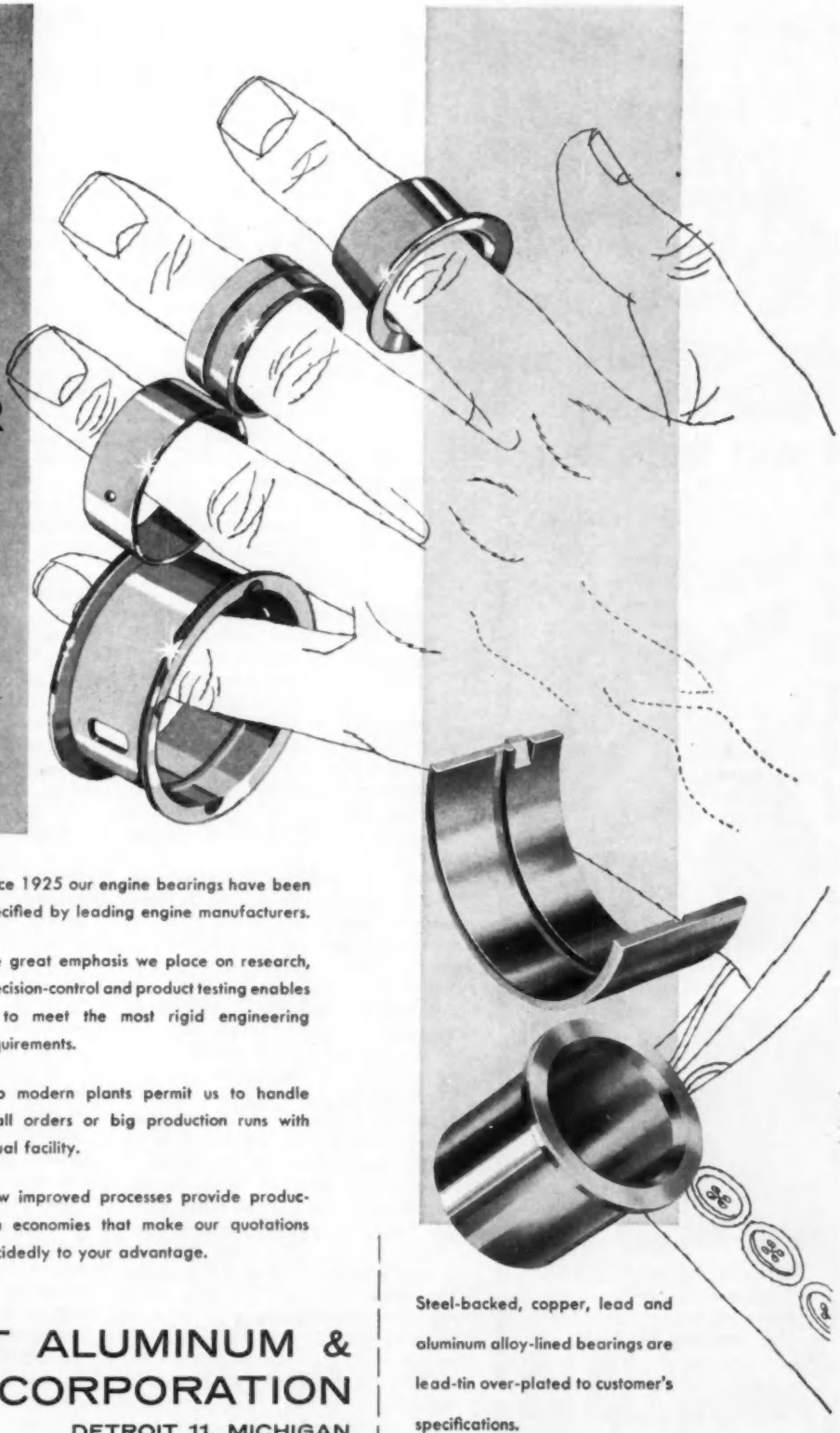
Be sure you have high quality, dependable control for the machines in your plant. To obtain more information on these G-E devices for the automotive industry, contact your nearest G-E Apparatus Sales Office or Distributor, or write Section 733-14, General Electric Company, Bloomington, Illinois, for GEA-6317, CONTROL FOR JIC APPLICATIONS.

* Trade mark, General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

4 THINGS TO REMEMBER THE NEXT TIME YOU BUY ENGINE BEARINGS



1. Since 1925 our engine bearings have been specified by leading engine manufacturers.
2. The great emphasis we place on research, precision-control and product testing enables us to meet the most rigid engineering requirements.
3. Two modern plants permit us to handle small orders or big production runs with equal facility.
4. New improved processes provide production economies that make our quotations decidedly to your advantage.

Steel-backed, copper, lead and aluminum alloy-lined bearings are lead-tin over-plated to customer's specifications.

DETROIT ALUMINUM & BRASS CORPORATION

DETROIT 11, MICHIGAN

Plants at Detroit, Michigan and Bellefontaine, Ohio

the only hot stamping machine that successfully marks thermoplastics and most thermosets

MODEL NO. 9AH FOR HOT OR COLD MARKING

Write for full details and latest literature upon successful, money-saving ACROLEAF Hot Stamping Machines.

The ACROMARK Company

303 Morrell St., Elizabeth 4, N. J.

"The Original Marking Specialists"

FLEXIBLE CONTROLS

for Body Conveyor and Painting Systems

(*Continued from page* 49)

proper conveyor if necessary and to turn on an indication light. These drives for the conveyor were Louis-Allis adjustable speed units with the electronic excitation panel and motor starter built in the control center. Excitation panels are arranged on hinged panels which can be disconnected at the Jones plug and removed.

The operator's position is at one of two floor-mounted consoles. One of the consoles, which connects with two control centers, provides the operator with seven actual choices or routings for bodies. The panel contains 25 push buttons, including a selection button and cancel button for each route. Other buttons control motor start-stop, clutch start-stop on the variable speed drives, manual or automatic operation of the rolls, etc.

The six-station automatic transfer system is one of the more complicated in the plant. This system provides for channeling all passenger car bodies from one weatherstripping conveyor onto seven body storage conveyors, each for one specific body type, i.e., Tudor, Victoria, Station Wagon, etc.

Referring to Fig. 1, the movements of automobile bodies are in the directions shown by the arrows. The body conveyors are represented by the closely spaced parallel lines. Heavy-lined rectangles indicate table lifts for transferring bodies onto and away from the transfer conveyor. All passenger bodies, except Fairlane models, are conveyed on the weatherstrip conveyor (lower left in figure). A body approaching the end of the weatherstrip conveyor can follow one of seven transfer sequences. Three of these seven sequences apply to station wagon bodies which come under still another transfer system (one shown lower right). As the body passes a control station, the operator can select any one of these seven transfer sequences depending upon the body type. If the body is a station wagon, it will proceed across the shuttle lift and thence into the station wagon transfer system. Bodies other than station wagons move onto shuttle lift, are lowered to transfer conveyor and move toward the top (in figure) until the conveyor selected for the body is reached. The corresponding lift will raise, depositing body on the selected conveyor.

These movements are all controlled automatically through electrical control circuits once the operator's selecting button is pushed. Features of the control circuits include the possibility of making several selections before the first body selected has approached the transfer conveyor. This is accomplished by memory circuits which retain control until the selected body has completed its transfer. Movements of the lifts and conveyors are largely controlled by limit switches on the conveyor and operated by the bodies as they progress through the sequence.

Upwards of 100 relays are required to accomplish the interlocking required in the system just described so that there will be no interference of bodies and so that minimum time is consumed in making transfers.

In addition to the automatic handling of parts provided by the conveyor systems, there is a great deal of automatic control provided for the ovens and spray booths. The control is so interlocked that ignition, and startup of the combustion blowers, exhaust fans, etc., must occur in the proper sequence.

The spray booths are quite automatic in operation. Some of the larger booths are provided with automatic de-sludging systems which continuously remove the accumulated sludge from the spray booth so that it is never necessary to shut down for cleaning.

The control for the larger spray booths provides for the proper sequence of pumps, valves, and several filters under normal conditions, emergency conditions, normal shutdown and emergency shutdown. The operator selects the type of operation required by means of push buttons, whether it be normal, emergency, or normal-emergency shutdown. It takes about 3½ hours after the operator presses the shutdown button before the control completes its series of operations for proper shutdown.

A point of interest is the unique circuit for automatic control of storage conveyors. Body units are loaded onto the storage conveyors from an automatic transfer system and un-

loaded by operators on the other end, either onto a transfer car or dolly type fixture. Since bodies are loaded and unloaded in a discontinuous process as required, the control had to be arranged so that when a body was removed from the exit end, the conveyor would automatically go through a reversing process which places all bodies near the entry end. This scheme provides solid maximum loading without unused spaces. For instance, perhaps only three bodies have been loaded in succession at the entry end, and at this point the operator at the exit end decides to unload one body. He depresses a bypass button which causes the conveyor to run forward carrying all three body units to the exit end. The first body loaded will automatically discharge at the end of the storage conveyor. After this, the control system will cause the conveyor to automatically reverse itself when the second body in line approaches the exit end, and return the remaining two bodies to the entry end of the storage conveyor. The conveyor is again reversed for a short period, long enough to ride the last-loaded body off the limit switch and provide just enough space for another body to roll onto the conveyor from the automatic transfer, with the proper spacing. This system was required to operate with only four limit switches, and it uses in addition nine relays and three timers. Under this type of control the storage conveyors are always operated at their maximum efficiency, and there are no unused gaps due to unequal loading and unloading schedules.

Lockheed Power Steering

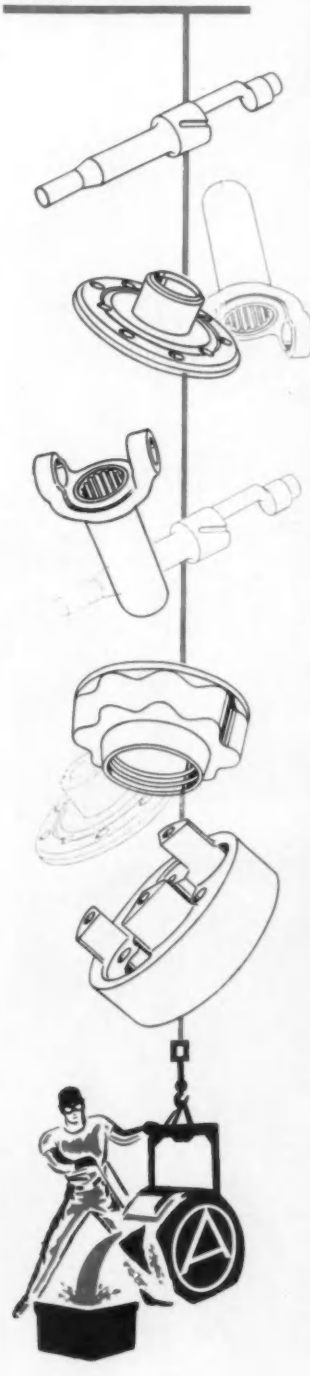
(*Continued from page* 60)

reaction area (N) and space (O).

When steering with the engine and pump stopped, the valve makes a full travel to stops (P), and thrust to the wheels is taken through the jack assembly which then acts as a conventional tie rod. Fluid builds up on either side of the piston through recuperation valve (Q).

At engine speeds above idling a flow valve in the pump unit by-passes excess fluid to the input line. This prevents the build-up of high back-pressures in the system, eliminating abnormal wheel positioning and increase in fluid temperature. Normal output loads are directly proportional to steering wheel effort until the relief valve comes into operation to avoid overload of the steering and suspension system.

designed to match your SPECIAL NEEDS

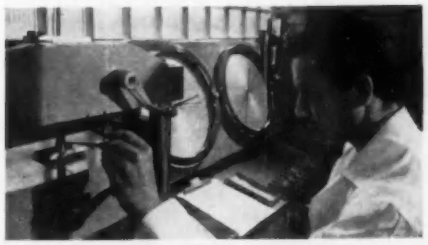


Saving your dollars with good, accurate castings is a 67-year old habit at Albion Malleable Iron Co.

Devising ingenious ways to shorten time between idea and delivery, creation of new designs, engineering new methods for more rapid, economical manufacture and delivery—all are routine benefits you realize when you specify AMICO—the experienced source that guarantees higher quality.

Remember, too, that Albion's ferritic and pearlitic malleable castings offer a new freedom of design, the elimination of excess metal for lower finishing costs. They afford unusually high wear resistance with excellent bearing properties. Also, maximum rigidity, prolonged fatigue life and amazing yield strength. They have a fine uniform grain structure for mirror-smooth finishing qualities and are adaptable to localized hardening.

If you are interested in better castings — why not phone AMICO today — they'll be glad to show you how many ways good, accurate, low-cost casting can save your equipment dollars.



ALBION'S RESEARCH AND DEVELOPMENT LABORATORY—*design engineers and production specialists are ready to help you design better products that can be make at lower cost—without obligation.*

ALBION MALLEABLE IRON CO.

ALBION, MICHIGAN

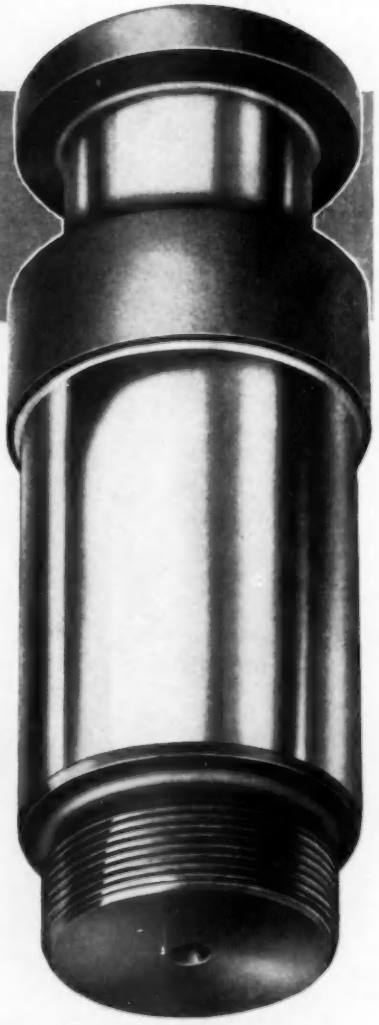
Observations

By Joseph Geschelin

Vetoes Solder

One of the big three is carrying on an experimental production program to eliminate the use of solder in body fabrication. Currently the company has 50 cars in the field in which the joints usually filled or faired with solder have been sealed with a special plastic filler material. One of the spokesmen feels the chances are good that within three years the company may be able to eliminate solder altogether.

Hardened and Ground Parts are our Specialty



This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-2⅜" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., +.000 —.001.

Parts like this are our specialty —we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

Henry W. Brown
PRESIDENT

Experienced production on:
King Pins • Wheel Studs
Shackle Bolts • Shackle Pins
Brake Anchor Bolts
Countershafts • Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
5th-Wheel Rocker Shafts
Water Pump Shafts
... anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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213 BELLEVUE AVE. SYRACUSE, N. Y.
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Aircooled Diesels

Aircooled Diesels have had much more exploitation in Europe than in the U. S. A. Later this year, however, we expect an announcement of a commercial line of Diesel engines employing the MAN combustion principle. One of our friends has contributed some excerpts from a paper presented by Dr. Richard Kloss in Boston earlier this year. Here are some interesting comments: In 1950, 14.4 per cent of Diesel farm tractor engines in Germany were aircooled; this rose to 41.1 per cent in 1955. Half of all Diesel engines exhibited at the 1955 Hanover Fair were aircooled as compared with but eight per cent in 1950. Twenty per cent of engine failures in German equipment were attributable to the water cooling system.

Overrunning Clutches

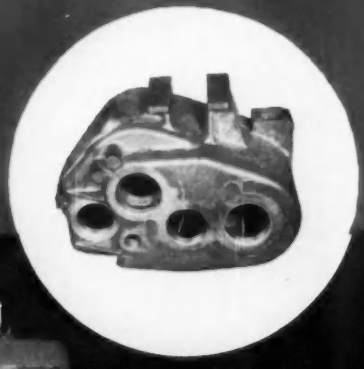
Formsprag overrunning clutches, well known for their applications in automatic transmissions, also have a wide variety of uses in industrial equipment. Among the successful applications is the use of Formsprag clutches in Paxon slitters made by the Paxon Machine Co.

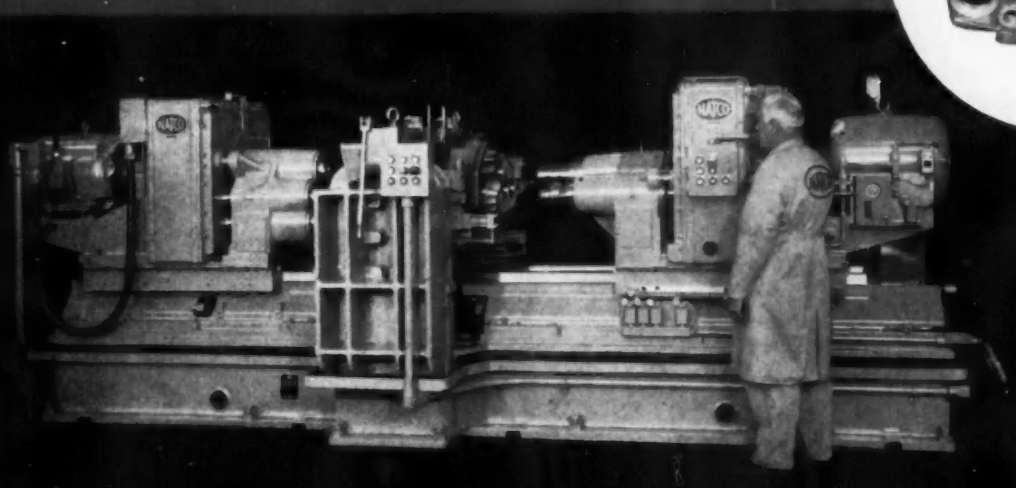
Two of these clutches are used on the ends of slitter arbor shafts where they permit the arbors to run free when the slitter has cut sufficient metal to enter the recoiler. A third clutch is used on the driven pinch rolls. These are smaller in diameter than the slitter arbors, are fitted with knives, and the function of the clutch is to reduce the speed of the pinch rolls until their surface speed is slightly lower than slittered speed. The latter arrangement cuts down noise and reduces wear on the entire mechanism.

Still another application of Formsprag in the machine is in driving the pay-off reel which rotates the coil. When the material enters the pinch rolls, the drive for the pay-off is stopped, and the overrunning clutch allows the sprocket and chain to continue rotating.

Natco® Automatic Matches Boring Mill Accuracy

and quickly converts for five different jobs





This Natco two-way machine stepped in where automatics "fear to tread!" It replaced a precision boring mill, speeded production and didn't give up a tenth in accuracy! At The Frank G. Hough Co. boring mills were used for exacting tolerances on transmission parts for the Hough Payloader®. Higher production was desired.

Now with a Natco two-way automatic, Hough is getting production rates—not job shop rates. The Natco bores diameters to within .0005"—square with mounting face within .0005" per inch bore length. The machine also chamfers, counterbores and notches boss contours.

Versatile too! Hough processes five different transmission housings or covers with a single machine. After a typical production run averaging 100 parts, the machine is quickly converted to another job.

Ask for information about the PAYD (Pay-As-You-Depreciate) Finance Plan.

Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

National Automatic Tool Company, Inc.

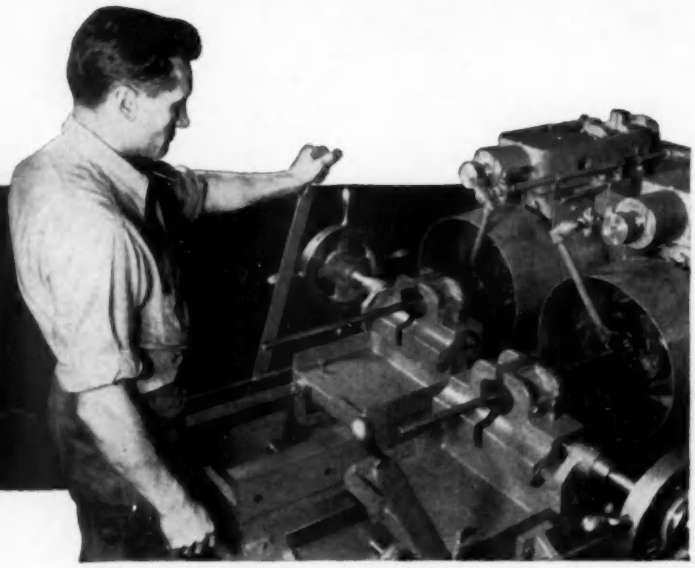
Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

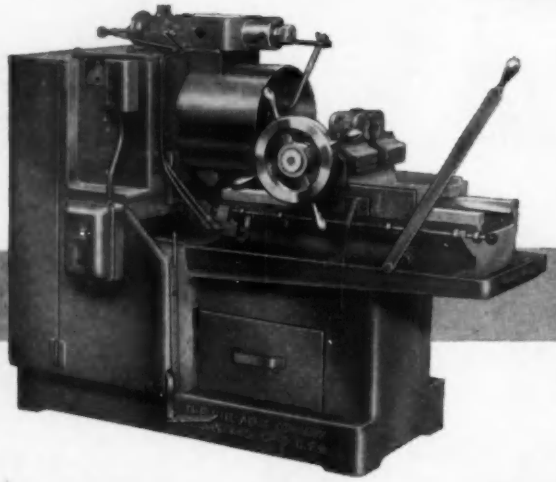
NATCO

The Acme model XLA Threading Machine

A new addition to the HILL ACME line of heavy duty precision equipment – RUGGED, ACCURATE, LOW PRICED



The ACME Model XLA Threader is a low cost, heavy duty threading machine designed for either maintenance work or for production operations when equipped with automatic features. The ACME XLA is built in single and double spindle design in sizes of 1", 1½", 2" and 2½" capacity.



ACME Model XLA Threaders can be equipped with either the "HILLCO" Tangential Die Head, for production work, or with the "ACME" Hob Type head for maintenance operations. This precision machine with it's amazing versatility is priced to fit YOUR budget.

Bulletin XLA gives complete details.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • **1209 W. 65th St., Cleveland 2, Ohio**

ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING & POLISHING MACHINES HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

HIGH-TEMPERATURE INSULATION?

silicone rubber retains dielectric strength at elevated temperatures

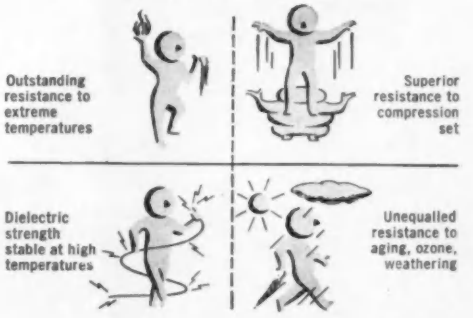
Need *high-temperature* insulation? General Electric silicone rubber insulation maintains exceptional stability under heat. For example, it's ideal for wire and cable where overloads or space limitations dictate a heat-resistant dielectric. Cables have been redesigned with it to carry nearly twice the current *—with no increase in size.* G-E silicone rubber makes Class H insulation possible—and greatly improves Class B.

Where can YOU use G-E silicone rubber?

There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression *of any known rubber!* Class 500 provides flexibility *at 150 F below zero!* Which class is best for *you?*

For more details on G-E silicone rubber, see your "Sweet's Product Design File."

G-E silicone rubber provides...


Outstanding resistance to extreme temperatures
Superior resistance to compression set
Dielectric strength stable at high temperatures
Unequalled resistance to aging, ozone, weathering

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SILICONE PRODUCTS DEPARTMENT
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Section 61-4C
Waterford, New York

Please send me, at no obligation, technical data on G-E silicone rubber, including a newly revised "Lightning Selector" and up-to-date list of fabricators

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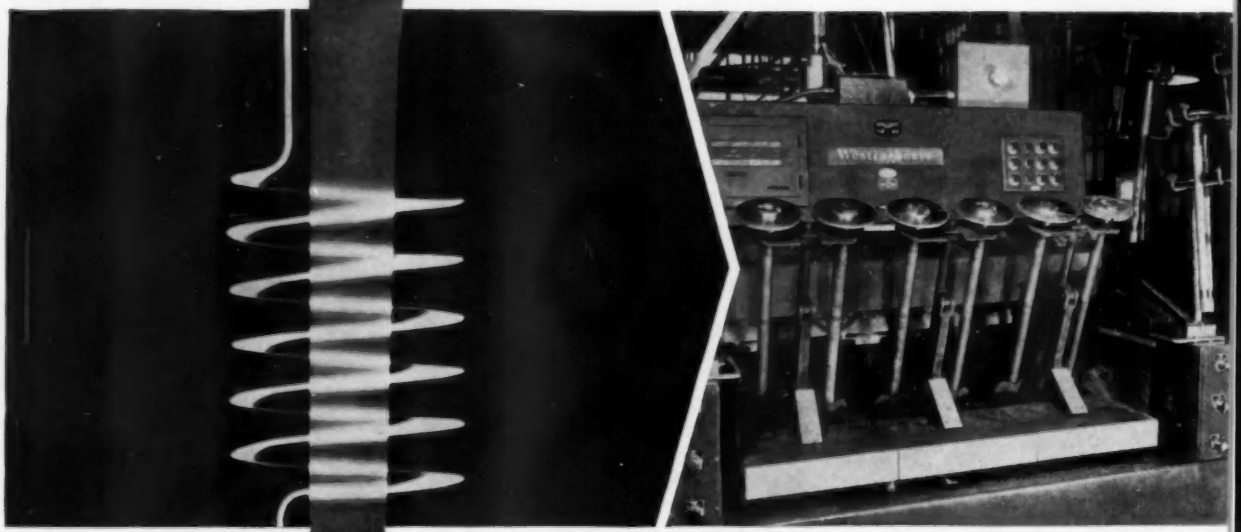
IN CANADA: MAIL TO CANADIAN GENERAL ELECTRIC COMPANY, LTD., TORONTO

Westinghouse induction heating doubles axle



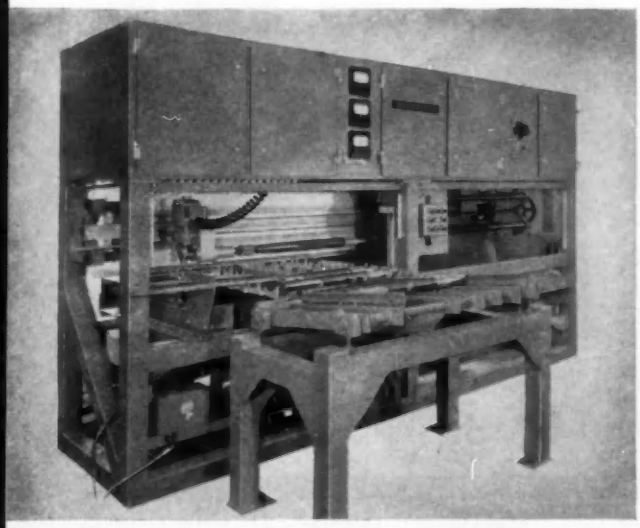
1. A single operator surface-hardens 6 rear-axle shafts at each setup of this Westinghouse induction unit. Production per hour totals 210 shafts.

R. W. Cheek
Manager, Induction Heating Department

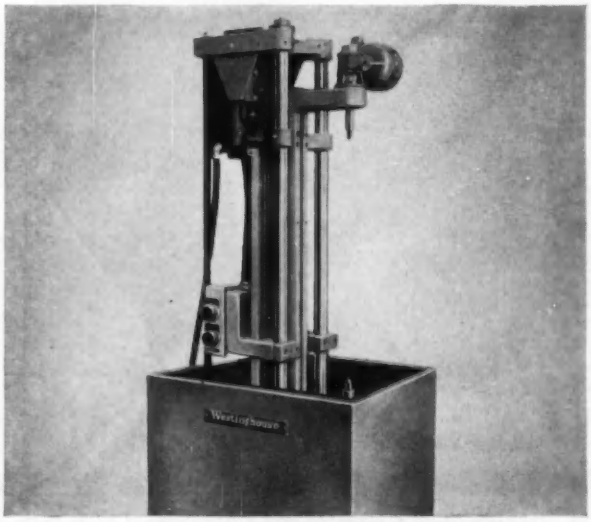
"Three different axle-hardening applications," reports R. W. Cheek, "show a slice of Westinghouse experience in solving production line heat-treating problems. Dependability of Westinghouse induction equipment, for example, protects production timing and holds maintenance to a minimum. Results are measured, too, in three important profit advantages."

1. Twice the axle fatigue life is obtained from lower cost, plain carbon steels. No more need for costlier alloys.
2. Lower carbon steels lengthen tool life . . . reduce machining and replacement costs.
3. Axle shaft distortion is minimized by rapid induction heating and quenching.

fatigue strength . . . lowers cost



2. As many as 33 axle shafts up to 42 inches long and weighing up to 100 lbs. are surface-hardened by this Westinghouse induction equipment.



3. Westinghouse general-purpose induction scanner handles shafts up to 30 inches long, 80 lbs. weight, for surface-hardening and quenching.

Many other factors, such as savings in floor space, rapid start-up, and cooler more productive working conditions add to the high efficiency of each installation.

A profit return for you? Westinghouse induction-heating experience can show you production problems turned into profitable solutions for hardening, annealing, joining, or forging. Why not call on your local Westinghouse industrial heating sales engineer? He'll bring you expert problem solving and complete service. Westinghouse Electric Corporation, Industrial Heating Division, Meadville, Penna. J-10455

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Bridgeport precision truck and trailer shapes are the rugged, lightweight backbone of many of the "extra payload, extra profit" units now on the road. Their high strength combined with low weight lets you build a durable, compact, finer performing product—save on assembly costs.

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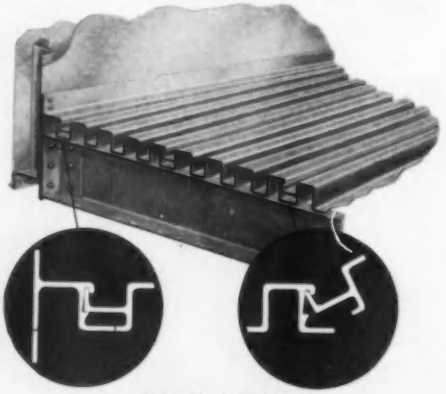
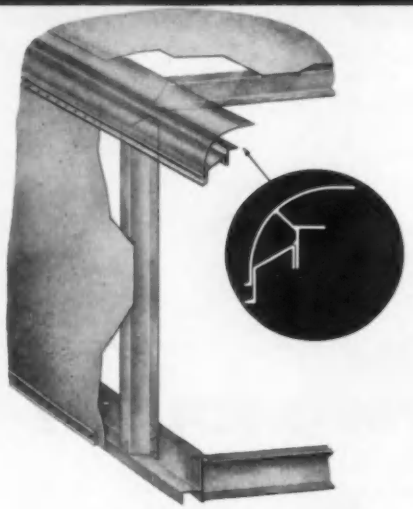
Complete, modern, fully integrated extrusion facilities can produce standard or special shapes in any standard alloy or temper to suit your specifications. Call your nearest Bridgeport Sales Office for full information and help in the selection of aluminum extrusions for your applications.

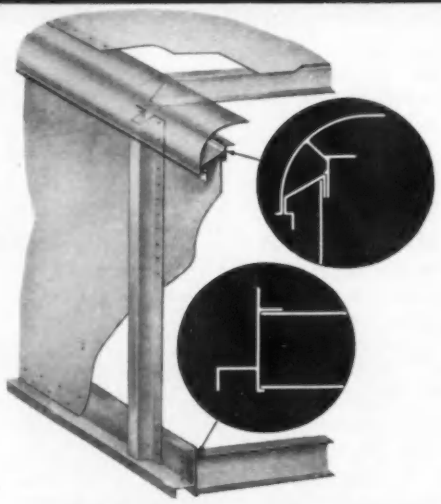


SNAP-IN REFRIGERATOR FLOOR

DRY FLOOR



SMOOTH POST



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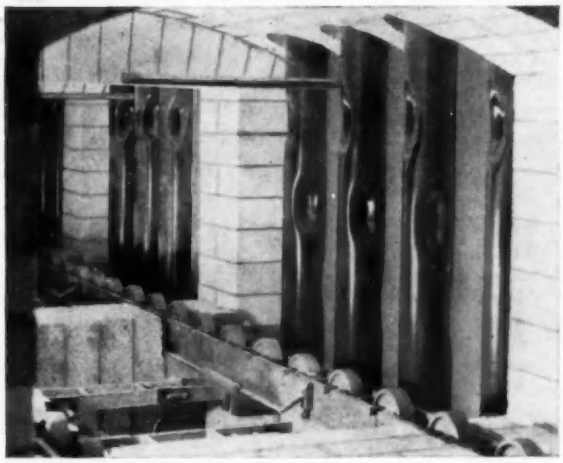

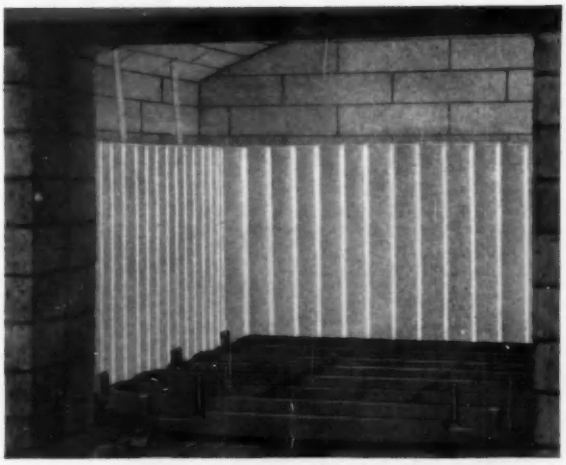

. . . IN THE GAS-FIRED FURNACE
NEW LINDBERG VERTICAL RADIANT TUBE

Because of its revolutionary design, this tube provides a new level of gas-fired furnace performance. The secret lies in the new Lindberg tube's "dimples." The tube carries a central stream of mixed air-and-gas surrounded by a cylindrical stream of air alone. Combustion occurs in the area between these two streams. The "dimples" create eddies accelerating combustion and maintaining even temperatures along the entire tube.

This Lindberg tube will operate at maximum efficiency for a longer period of time. The special protective coating gives greatest possible resistance to carbon penetration. Vertical position eliminates soot deposit and resultant temperature increases at points of sooting.

Tubes are 59 inches long, weigh only 29 pounds, changeable in a few minutes. No costly furnace shutdowns nor high labor and material cost for tube changes.

. . . IN THE ELECTRIC FURNACE
NEW LINDBERG CORRTHERM ELEMENT

CORRTHERM, Lindberg's radically advanced new electric heating element offers advantages never before available for heat treating furnaces. With this new element carburizing and carbonitriding with electricity becomes practical, efficient and economical. Ideal, too, in other types of Lindberg electric furnaces.

The outstanding feature of the CORRTHERM element is the extremely low voltage at which it operates. Consequently, leakage through carbon saturation and shock or short hazards are eliminated. Elements also act as baffles to direct circulation of convection streams.

CORRTHERM elements are practically indestructible. Work load or operator's charging tool can't hurt them. Watts density is at all time low. Easily installed or replaced, too, as element merely hangs in furnace and no complicated mountings are required.

Lindberg Field representatives in 21 cities are ready to show you how Lindberg furnaces with these revolutionary new elements can improve your heat treating process. You'll find your Lindberg representative's name in the classified section of the phone book or write us direct.

LINDBERG FURNACES

LINDBERG ENGINEERING COMPANY

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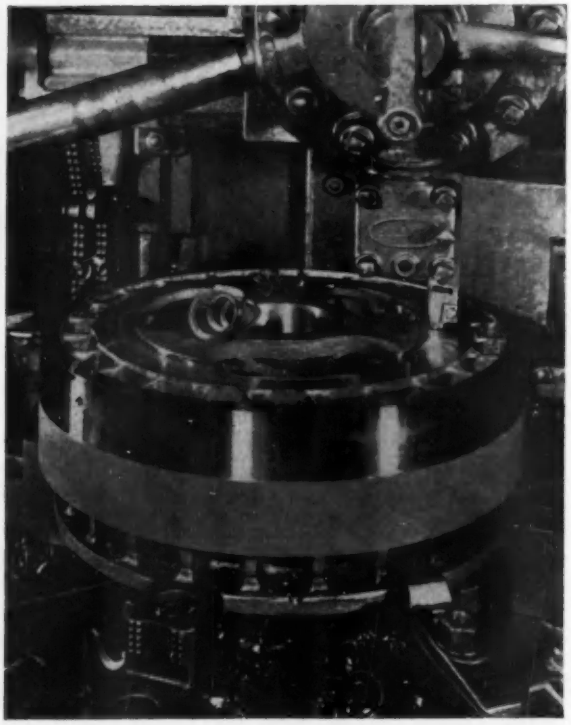
By using "Equivalent Grade" Charts when buying carbides...

YOU MAY LOSE THOUSANDS BY SAVING A FEW

Relying on "Equivalent Grade" Charts can lead to purchasing on low initial cost alone... whereas production ability really determines a tool's worth



TESTS ON 1045 CAST STEEL by a Chicago machine manufacturer demonstrate tremendous differences in carbides' production abilities. With Grade "X," as many as 16 clamp-on-type carbide inserts were required for a single facing cut on this power shovel clutch and brake drum.

A single Grade "Y" insert (Carboloy Grade 370) took nine cuts without showing any appreciable wear . . . under identical operating conditions. Result: over-all tooling cost reduced 90% on the 15-piece comparative run.

THE SO-CALLED "Equivalent Grade" Charts may be costing your plant literally thousands of dollars a year . . . in lost production, wasted manpower, higher machining expense.

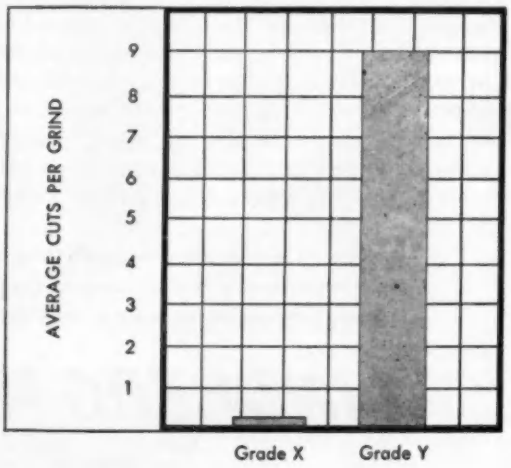
These charts conceal the tremendous differences in production abilities that always exist among various "equivalent" carbide grades. Worse, they tend to justify using initial cost, rather than over-all performance, as the basic criterion for purchasing carbide tools.

In-plant tests prove production abilities vary

What will happen to production if carbides are selected on the basis of the "Equivalent Grade" Charts? The case history at left gives the answer. It is typical of hundreds in the Carboloy files.

The average "Equivalent Grade" Chart lists no fewer than 14 different grades for this job . . . and implies that they can be used interchangeably. But in-plant comparative tests proved that no two grades could provide the same results.

When Grade "X" was selected, for example, an average of four inserts were required to take a single facing cut. But when Grade "Y" was used, a single carbide insert produced nine cuts . . . a tool life increase of 36 to 1 (Graph No. 1).



Graph No. 1—Production Ability Comparisons

OF PRODUCTION DOLLARS TOOLING PENNIES

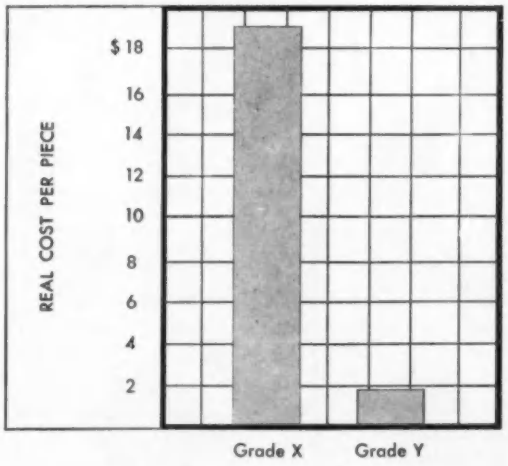
Why the tremendous difference? Grade "Y" simply had more production ability. It brought far more production per grind, reduced downtime, and drastically lowered grinding costs. Yet nothing in the "Equivalent Grade" Charts could predict this.

Initial Costs vs. Real Costs

Because "Equivalent Grade" Charts imply that all grades perform alike, they make it logical to assume that low initial cost is the most important consideration. A little arithmetic will prove that the *real* cost of carbides bears no relation to initial cost.

With Grade "X," total tooling cost for 15 pieces was $285.68 (16 tools at $13.04 each; 44 regrinds at $.41 each; 59 tool changes at $1.00 each). Machining cost per piece was $19.05.

Grade "Y" inserts cost $1.30 more initially. But total cost for 15 pieces was just $29.68 (2 tools at $14.34 each; 1 tool change at $1.00; nothing for regrinds). Real cost per piece with Grade "Y" was $1.98 . . . a reduction of 90%!



Graph No. 2—Real Cost Comparisons

Now add to these savings in tool cost, downtime, and grinding charges, the equally important savings from lower total manpower costs and reduced inventories. Then multiply the total by the number of jobs in the plant where similar cost reductions can be realized. You'll see why a few pennies more per tool is a small price to pay for carbides that can save you so much.

Cost-conscious purchasers specify Carboloy Extra-Performance Carbides

Grade "Y" in the preceding example is Carboloy Grade 370. It is one of three new, extra-performance steel-cutting carbides. These three grades – 330, 350, and 370 – cost slightly more initially because they are made by a unique and more costly process. But their performance is so superior to conventional carbides that there is no classification on the "Equivalent Grade" Charts to fit them.

Because of their extra production ability, these carbides easily show up the glaring shortcomings of the "Equivalent Grade" Charts. But even on conventional grades, actual tool comparisons prove the charts cannot be relied upon.

That's why we make this suggestion: Have comparative tests run in your own plant, on your own jobs. When the results are in, you too may find that your plant can save thousands of dollars a year simply by switching to carbides with greater production abilities.

With so much money at stake on every carbide tool used in your plant, you can easily see why the phrase "or equivalent" is rapidly becoming obsolete on tool specifications. These tests prove it really pays to specify *Carboloy* cemented carbides – by name.

If you would like a more detailed discussion of the whole subject of Initial Costs vs. Real Costs, and the fallacies of the so-called "Equivalent Grade" Charts, write today for a Carbide Sales Engineer to call on you. *Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Street, Detroit 32, Michigan.*

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CARBOLOY

CEMENTED CARBIDES

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6 minutes . . . 45 seconds

and this ten hole

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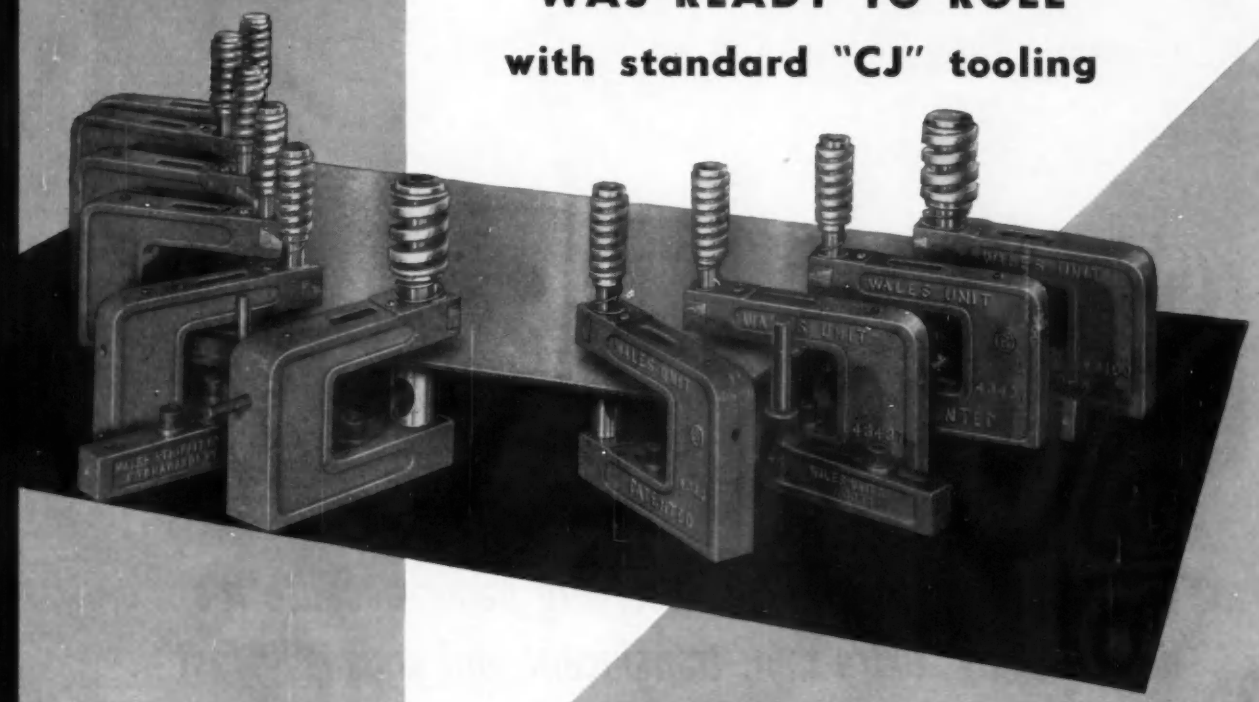
WAS READY TO ROLL

with standard "CJ" tooling



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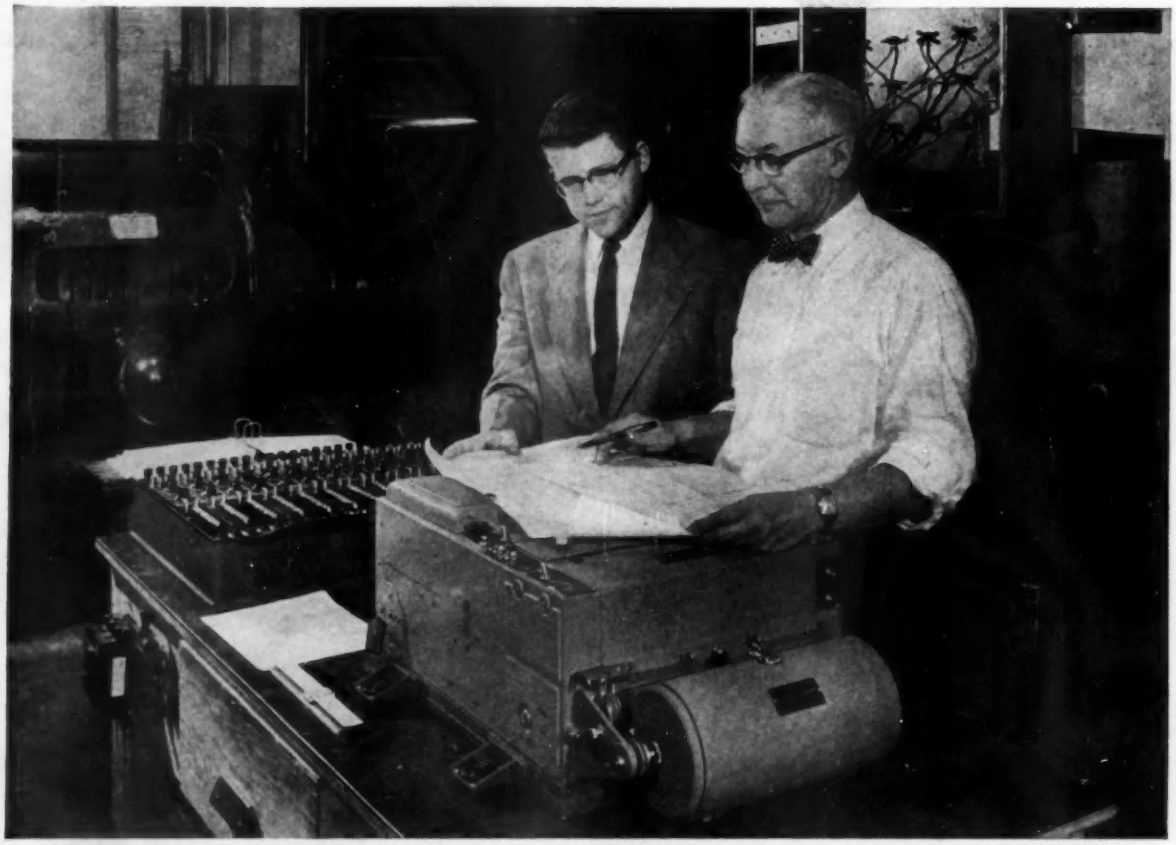

LABORATORY DIRECTOR Smith (right) and Robert Mason of Du Pont examine an oscillograph trace, recorded on Du Pont Lino-Writ 3, Type *W*, oscillographic recording paper.

"We use Lino-Writ photorecording paper because it's non-cracking, extra-thin, translucent and unusually fast"

—says Mr. Robert Smith, Laboratory Director, I-T-E Circuit Breaker Co., Philadelphia, Pa.

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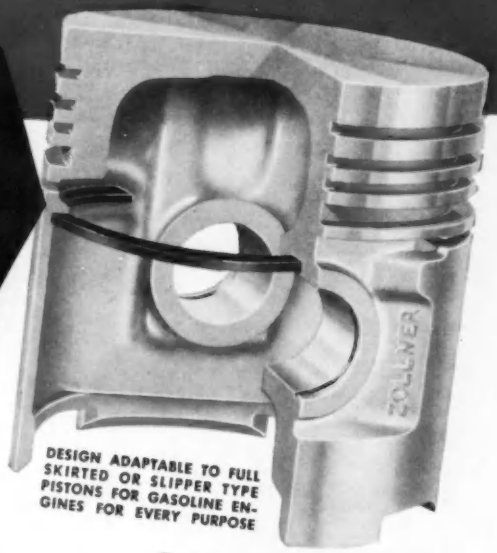

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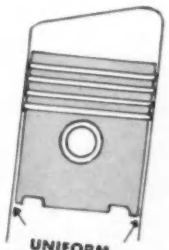

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